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ABSTRACT

This Congressional report deals with the views of persons residing and working in the Silicon Valley in California and near Route 128 around Boston on strategies for encouraging entrepreneurship. Included among those persons providing testimony concerning the perspectives of individuals and groups from these two regions were representatives of the following agencies and organizations: Intel Corporation, Fairchild Camera and Instrument Corporation, Regis McKenna Public Relations, National Semiconductor Corporation, Advanced Micro Devices, ROLM Corporation, Tandem Computers, ASK Computer Systems, Daisy Systems Corporation, CAE Technology, Technology Venture Investors, Spinnaker Software Corporation, Stratus Computer, Charles River Partnerships, Narragansett Capital Corporation, and Morgan Holland Management Corporation. (MN)

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CLIMATE FOR ENTREPRENEURSHIP AND INNOVATION IN THE UNITED STATES

HEARINGS

BEFORE THE

JOINT ECONOMIC COMMITTEE
CONGRESS OF THE UNITED STATES

NINETY-EIGHTH CONGRESS

SECOND SESSION

PART 2

AUGUST 27 AND 28, 1984—A SILICON VALLEY PERSPECTIVE

AUGUST 30 AND 31, 1984—A ROUTE 128 PERSPECTIVE

Printed for the use of the Joint Economic Committee

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A SILICON VALLEY PERSPECTIVE

MONDAY, AUGUST 27, 1984

CONGRESS OF THE UNITED STATES,
JOINT ECONOMIC COMMITTEE,
Washington, DC.

The committee met, pursuant to notice, at 9 a.m., in the city council chambers, city hall, 456 West Olive Street, Sunnyvale, CA, Hon. Daniel E. Lungren (member of the committee) presiding.

Present: Representatives Lungren, MacKay, and Zschau.

Also present: Charles H. Bradford, assistant director; and Robert Premus, professional staff member.

OPENING STATEMENT OF REPRESENTATIVE LUNGREN, PRESIDING (PANEL 1)

Representative LUNGREN. Good morning.

This starts the series of hearings that we're going to have, both in Silicon Valley and in Route 128 in Boston later this week, discussing the phenomenon that has arisen in both areas to try and give us some information and some basis for decisionmaking in the Congress. And although this is an official hearing of the Joint Economic Committee, this morning we have been joined by two Members of Congress from different, but related, committees who have their own perspective to bring to our hearings.

Congressman Buddy MacKay from Florida is joining us this morning, and of course Congressman Ed Zschau, the Representative of this district. And I'm very appreciative of the fact that they will be assisting us in our inquiry.

The Santa Clara Valley, an area once world-renowned for its fertile land, cherry, apricot, and prune orchards, is now renowned as a region fertile for its ideas, inventions, and entrepreneurs. In three decades, this valley has undergone a dramatic and extraordinary transformation from an economy based on agriculture to one buttressed on technology.

Sunnyvale, the city in which we hold these hearings today, is now recognized as the home for more electronics companies than any other city in the world. Additionally, Silicon Valley has been the birthplace of many of the most used technological inventions of our day. Actually, the innovation occurring in Silicon Valley has been instrumental in the development of, among other things, the pocket calculator, the personal computer, and laser technology.

Regis McKenna, perhaps, best captured what Silicon Valley is all about when he stated:

> Silicon Valley is more than a place; it's a phenomenon, it's a symbol of innovation, growth, entrepreneurship, the prosperous future high technology and the

coming of the age of information; it is educating the rest of the world on how to survive in the 21st century.

It is my belief that the factors behind the development of the Silicon Valley phenomenon hold many lessons and applications for public policy, particularly since a major debate on the role of the Government in the economy has been underway in the Congress for well over a year.

Regrettably, much of that debate over a national industrial policy has been too quick to look at the superficial success of other countries while neglecting to look at our own strengths. This persistent look-over-the-shoulder approach has taken us down the path of what I refer to as the "let's copy Japan, who first copied us" syndrome.

In the meantime, Silicon Valley in many respects has come to epitomize the pioneering, risktaking spirit that has been traditionally associated with the United States. Amidst proposals for increased central planning in Washington, Silicon Valley has served as a reminder of the vitality and force of the private entrepreneurial spirit.

It is my hope that these series of hearings, which began in Washington 3 weeks ago, will highlight one of our greatest talents, our country's ability to innovate, and one of our greatest resources, the entrepreneur. The committee intends to examine the governmental role at all levels in fostering an environment of innovation and economic growth.

The field hearings which we start this morning represent, I believe, the first attempt at a comparative analysis of the entrepreneurial environment in the Nation's two premier high tech centers. These 2 days of the committee hearings in Sunnyvale will be followed later in the week by 2 days of hearings in Boston as we receive testimony from entrepreneurs in the Route 128 community.

It might be interesting, as we go through this, to ask those of you from this area what you think the similarities and dissimilarities are with Route 128, and then ask the same question out there and see who knows what the other is doing, and what they want to copy, and what they don't want to copy.

Before we go to our first panel I would just invite Congressman MacKay and Congressman Zschau to make any statement, if they wish. Congressman MacKay.

OPENING STATEMENT OF REPRESENTATIVE BUDDY MacKAY

Representative MACKAY. It is my pleasure to be here. I'm interested from the standpoint of the point of view of the Committee on Science and Technology and I'm interested in the whole question of civilian research and development, and our national policies having to do with that, the consequences of mistakes in policies, and what Government could be doing better, and where we now are that we should not be, and any lessons that there are which we could learn from our international competitors.

So, that's sort of my frame of reference on the issue. I'm very pleased to be here and particularly to have a chance to hear from panels of experts who obviously have been here from the beginning. And if anyone can describe the phenomenon that is Silicon Valley, it's the people in this room.

Representative LUNGREN. Congressman Zschau.

OPENING STATEMENT OF REPRESENTATIVE ZSCHAU

Representative ZSCHAU. I just want to say welcome to my colleagues. I'm delighted that you decided to hold these hearings here because you're right, Silicon Valley is a phenomenon. It is not unique because there are other areas. But certainly in the magnitude of what's been accomplished, it is representative of the finest example of the free enterprise system at work.

I think it's important for those of us in Government to try to understand what makes the free enterprise system work and what makes entrepreneurial activities and innovative activities take place.

In addition to this hearing to provide insight into Silicon Valley, I think we can all look forward to this fall. I'm told that one of the major television networks is going to have a soap opera about Silicon Valley. And in the advanced notices of this show I'm told that it purports to tell in intimate detail the story of technology and lust.

So, I'm not sure whether you're going to get into the latter subject here.

Representative MACKAY. I don't see that on our agenda. I would ask staff——

Representative ZSCHAU. Well, maybe we could have a panel that's devoted to that subject.

Let me just comment that at least on the first subject, "Technology and Innovation," the witnesses that the committee has assembled are experts on that, and I look forward to hearing their testimony.

Representative LUNGREN. If I might just say, Congressman Zschau has done a tremendous job of presenting the perspective of the folks of Silicon Valley. If he has done nothing else, he now has Members of Congress pronouncing it "Silicon" instead of "Silicone" Valley, and I think many of you will recognize that as quite an improvement.

We will now receive a statement for the record from Christy M. Campbell, director, California Department of Commerce.

[The statement of Ms. Campbell follows:]

GROWING OUR OWN JOBS: ENCOURAGING CALIFORNIA'S ENGINEERS

TESTIMONY FOR THE JOINT ECONOMIC COMMITTEE OF CONGRESS

BY

CHRISTY M. CAMPBELL

DIRECTOR

CALIFORNIA DEPARTMENT OF COMMERCE

SEPTEMBER 24, 1984

The entrepreneur is once again a hero in America. Spurred on by fantastic start-up stories and lucarative public offerings, many men and women are taking the risk that their ideas can become profits.

California is the launching pad for a disproportionate number of those would-be Horatio Algers -- just as it has been since the forty-niners. From the discovery of gold over 150 years ago to advances in the information age by graduate students tinkering in surburban garages, California's history has been marked by men and women making the rags-to-riches story commonplace.

However, in recent years California state government has sometimes appeared bent on pricing -- and regulating -- business out of the state, and with it, the spirit of the entrepreneur. It is no wonder, then, that we have found ourselves in increasing competition with other states for the attraction of new and growing businesses.

Such competition heightens the challenge of job creation at a time when California's workforce is projected to outrun its current job growth rate. The California Department of Commerce last year forecast a job gap of 1.4 million jobs by 1990 -- a ten percent rate of unemployment -- at current rates of job growth.

That means to keep Californians employed some 500,000 jobs must be generated each year. California's economy now generates 200,000 new jobs per year. From where will the additional 300,000 jobs per year come?

We believe those jobs will come from our emerging "home grown" companies.

Our studies project that 70 percent of all new jobs in California will be generated by our own entrepreneurs — small, fast-growing businesses in a wide array of industries.

It should be no surprise that the California Department of Commerce's strategic plan for economic development places great emphasis on the role of entrepreneurs in job creation. That plan calls for a two pronged strategy:

- Improve the governmental balance sheet for small business by expediting start-ups, streamlining the regulatory and permit processes, and making expansions easier, and

- Create a climate in which embryonic projects in high-tech and non-high-tech industries can incubate by providing the educational resources, capital, management training and technical assistance upon which a good idea builds.

In this arena, California clearly has a running start. For example, higher education in California has always shared a synergistic relationship with the entrepreneurial community. Thirty years ago, Stanford's dean of engineering, Frederick Terman, encouraged professors and students alike to cooperate with local industry. The result: the Silicon Valley. Stanford numbers amongst its graduates William Hewlett, David Packard and Russell Varian: all far more productive job creators than any package of state give away programs.

Venture capital thrives here, as well. California is not only the banking and financial center of the western United States; more than one hundred of the 500-plus American venture capital investment firms are located in California. Over 35% of all venture capital invested in America goes to California startups.

As a result, this state far outdistances all other states in the number of fast-growing companies it hosts. California headquarters 27 of the INC. Magazine 100 fast-growing small public companies; 100 of the INC 500; and 40 of the VENTURE Fast Track 100.

Wise businesses build on their strengths. That is why California must build on its unique advantage: an entrepreneurial community that continues to shape California's, and the world's, tomorrows.

To encourage such growth, state government must support legislation that smooths the process for startups and expansions. Recent steps supported by this administration include:

- Reducing the capital gains tax and liberalizing tax loss provisions by permitting new small businesses to carry forward net operating losses of up to $100,000, as well as providing favorable capital gains treatment for returns from sales of small business stock investments;

- Establishing small business development centers linking government resources with educational institutions and the private sector throughout the state — providing one-stop assistance for a shopping list of questions from information-hungry entrepreneurs;

- Encouraging public review of regulations adversely affecting small business; and

- Providing the state with $1.5 million to better communicate California's story to promising entrepreneurs nationwide.

At the same time, state government must reinvest in the basics essential to a sound business climate.

The state's Office of Administrative Law has repealed or rejected some 4,165 unnecessary regulations, and Governor Deukmejian's Task Force on Regulation is reviewing the California Administrative Code in order to stem the tide of new regulations.

California state government is renewing its investment in education. Funding for K-12 educations is 17 percent higher than two years ago and higher education received its largest real spending increase in more than a decade to $4.1 billion.

In addition, California has developed a special business/academic partnership program for microelectronics research on UC campuses, jointly financed by industry and the state government. The MICRO program, as it is called, recently received a $2 million increase in funding, to be matched by private industry.

And, the state's infrastructure is on the mend. Nearly $4 billion is to be spent on capital outlays this fiscal year and more than $13 billion has been committed to upgrading our roads and highways over the next five years.

Clearly, California is uniquely positioned to create jobs by assisting "home grown" start-ups and entrepreneurs while other states rely on large government subsidies and give aways to lure business to their borders. California has long been home to a fraternity of business freethinkers who attempt the impossible and attain the improbable. That is what state government must continue to nourish if Californians are to find jobs in the years ahead.

Representative LUNGREN. The first panel we have this morning is made up of a number of individuals who know the story very, very well. We have Robert Noyce, Lester Hogan, and Regis McKenna. I might mention to all of you that if we could try to limit remarks to around 10 minutes apiece, then we can engage in questions and answers. Your prepared statements will be made a part of the record, so you may proceed as you wish with that knowledge.

Our first panelist is Mr. Robert Noyce, the vice chairman of the board of Intel Corp. Welcome and thank you for coming.

PANEL 1. SILICON VALLEY DEVELOPMENT: A HISTORICAL PERSPECTIVE

STATEMENT OF ROBERT N. NOYCE, VICE CHAIRMAN, INTEL CORP., SANTA CLARA, CA

Mr. NOYCE. First of all, let me tell you that it's a great pleasure to be here. I consider myself primarily an industrialist, but I am a member of the National Academy of Science and the National Academy of Engineering. I got my training in Boston, and I would say that it's like being reborn while we're being born.

I did choose to come out here. As a matter of fact, Mr. Hogan also spent some time in Boston, so we're familiar with both coasts. We choose to be here.

California has received a lot of attention recently between the Olympics and the Democratic Convention, but I'm glad to see it's extending now to, what I consider, the most essential part of California, namely its industrial environment. It's developed very rapidly in the last 25 years.

If we would look back 25 years ago and look at the premier electronics companies in the valley you would find that Hewlett-Packard had revenues of $48 million, Varian had revenues of $38 million, and Fairchild—which probably is the reason Silicon Valley is called Silicon Valley—was a startup and the previous year it had sales in silicon of less than $1 million.

Things are very different today, and I think it's interesting to look back and see some of the things that made this valley flourish and what makes it work.

Silicon Valley has a kaleidoscopic popular image. As Ed indicated, it's even enough to write a soap opera about. It is entrepreneurial. It is an area of high wealth, with people that play for high stakes, people that have lost a lot of money, too, in their entrepreneurial activities. It's all of these things.

It now is an area that covers all the way from Marin to Monterey. It includes not only silicon, but the use of the products that are made out of silicon in the electronics industry and going on into the biological sciences now.

What attracted us to this area? First of all, it is one of the best climates in the world. We have good weather and an unspoiled—at least at that time—terrain nearby. There were several engineering stars that were here. I think Mr. Hogan will mention some of those, but let me mention one in passing which is a historical accident. Bill Shockley, who was the inventor of the transistor, happened to grow up in Palo Alto. That is a historical accident, but is part of the reason that Silicon Valley is here.

We have very strong universities, and that's important. These are knowledge industries in which having knowledge and a base of knowledge in the environment is extremely important.

Again, it was a new area. There were no confining traditions, there was no one around to tell you that's the wrong way to do it. So we were able to explore, to try new ideas, and to do new things.

I would like to mention, since it is covered in my notes, some of the things that I think that the Government should and should not do, in order to promote this kind of phenomenon. Let me take some examples that are current.

First of all, I'd like to go back to the immigration bill, the Simpson-Mazzoli bill. This area has become a mecca for technical talent and it has attracted technical talent from around the globe. The House version of the Simpson-Mazzoli bill, as it now exists, would after 1989 prevent foreign students from attending universities to stay in this country without first returning home.

Let me just mention that the first microprocessor was done by an Italian engineer, namely, Federico Faggin, who went on to form Zilog, one of the major companies in the area. The first EPROM at Intel, which was one of the most important products that we have done, was developed by an Israeli working at Intel. A Japanese engineer designed the 8080 microprocessor. Aryeh Finegold, an Israeli, started Daisy Systems, which is one of the major computer-aided design/computer-aided engineering companies. Philip Hwang of Korea started Televideo, which is one of the most successful terminal and microprocessor/microcomputer outfits in the valley. Sirjang Lal Tandon from India started Tandon Computers.

Currently, of all of the new engineers hired by Intel directly from the universities, 80 percent of the Ph.D.'s and 50 percent of the master's level employees are not U.S. citizens. Now, that's a little bit higher than the output of the universities, but you must recognize that the defense industry cannot hire those people and consequently it concentrates on the U.S. citizens in its hiring.

So that the pool that we have to hire from after the defense industries have gotten their's is much more heavily weighted toward the foreign born. We also try to hire the brightest students who tend to be the foreign born. I hope you'll forgive me for saying so, but they are better prepared than our students here.

The other act which is getting to be a negative is the Export Administration Act. Anytime that we close markets to ourselves or make it difficult for our industry to serve overseas markets we destroy our economies of scale. We invite competition from other countries, and I think that we are destroying the basic fabric of our society which has contributed to our defense strength.

If we are to become a closed society in order to protect our military strength, we've given up the reason we want military strength, namely, so that we can have an open society. Furthermore, it's bad science. I think that all of us on this side of the table anyway would agree that nonmilitary research, open research, is more productive than closed research. So that is another area where I think we are tending to shoot ourselves in the foot.

On the other hand, there are some areas where the Government has helped industry maintain its leadership and I would like to mention those. They have to do with venture capital, with the R&D tax credit, and with the tax treatment of employee education.

In 1978, Ed Zschau helped us get the Steiger amendment through and, as you know, that has resulted in an increase in venture capital from $50 to $100 million a year to something like $4 billion last year. Very important.

Let me go on to the educational reimbursement. With Intel we see the tuition reimbursement as a long-term investment. Last year we spent three-quarters of a million dollars in reimbursing tuition to our employees. One of the things that has happened in the new rulings on education reimbursement is that the education must be directly related to the current job, not a future job.

Consequently, the professional people can qualify because almost anything they learn is applicable to the present job. And we now have a two-tier kind of a situation where the woman that's working on the assembly line, who is trying to get an engineering degree and must have English in order to qualify for her degree, cannot get reimbursed for that.

The question we have is whether we need to fire people first so that they can get reimbursed for retraining. Do they have to lose their jobs before they can get retraining? We feel that that is shooting ourselves in the foot. It has been good in the past.

Let me just organize my thoughts here in the way I like to in referring to what creates this kind of environment. I call it the four M's.

Money: Any new industry requires money. Anything that we can do to encourage savings is going to be important to us; anything that we can do to encourage risk taking and the investment of that new money in new industry is going to be important.

Manpower: Commitments to education. The fuel for high tech industry is knowledge and an educated work force. And that is at all levels, not only the Ph.D.'s, but the people that are working down in the lower classifications of the organization.

Markets: Of course, the U.S. market is the biggest one, but we've got to have access to the worldwide markets if we are going to be a world class competitor. And that is what this is all about.

Motivation: It's a motivation throughout the entire society. Whether it's the kids in school getting educated in something that will make a true contribution to their society, or the ability of people to go out and take a risk and get properly rewarded if they are successful, and also frankly the ability to fail if they are not successful.

I think the four M's are really the clue to what has made Silicon Valley what it is. I'd be happy to answer questions later.

[The prepared statement of Mr. Noyce follows:]

PREPARED STATEMENT OF ROBERT N. NOYCE

I. Introduction

II. Opening Remarks

A. Between the Democratic Convention and the Olympic games, California has received a lot of attention this summer. I'm happy to see this interest extend to our section of the state, and to our slice of California's industrial base.

B. Twenty-five years ago, had members of Congress ventured out here on a similar mission, they would have found a valley full of fruit orchards, with a few canning and processing plants scattered here and there. Small companies like Hewlett-Packard and Varian existed, but had little impact on the region's (let alone the nation's) economic or social fabric.

1. To give you an idea of the electronics industry's modest size at that time (1959), Hewlett-Packard had annual revenues of about $48 million, Varian had revenues of $38.1 million, and Fairchild brought in $7 million in annual sales.

C. Today, of course, things are different. As a resident of this area for 27 years and a participant in the growth of its electronics industry, I would like to share some thoughts with committee members as to what makes "Silicon Valley" what it is, and in what ways governmental actions work to nourish -- and jeopardize -- its overall health and ability to grow.

III. "Silicon Valley": What It Is, What Makes It Work

A. Silicon Valley's popular image could be called kaleidoscopic. One image may portray it as full of engineers glued to their labs, where yelling and loud arguments are common and competition is keen. Another portrayal pictures buildings with partitions instead of walls, offices without doors, where everyone is on a first-name basis. Finally, there's the entrepreneurial vein, pulsing with high stakes, new wealth, and business plans.

B. Actually, "Silicon Valley" is all of these. It incorporates a range of industries, some of which have little to do with silicon. Everything from electronic components, personal computers and telecommunications, to biotechnology, medical instrumentation and software thrives in a geographic area that spans from Monterey to Marin county.

C. What "Silicon Valley" companies have in common is that they are knowledge intensive, develop and use new technologies, and as a result, often compete in markets that are still emerging.

1. What attracted many of us to this area was:

   °good weather/unspoiled, diverse terrain nearby

   °several engineering "stars"

   °strong universities

   °the "newness" of its industrialization, which by definition, meant that entrepreneurism would thrive

   °there were no confining traditions due to the large number of young, technically trained individuals who had only recently immigrated to the area

2. These conditions, to a large degree, hold true today. In particular, the area's intellectual and technological resources have created a technological "mecca," attracting talent from all over the world, and creating an outlook that is international in scope. What has happened along the way is that as a "critical mass" of people and activity is achieved, it works to stimulate an even more vigorous level of creativity.

D. In terms of management style, "Silicon Valley" companies are by and large committed to a decentralized, egalitarian approach. In most cases, these companies are still in their first generation and thrive on the same principles of accessibility, informality and "searching for excellence" that sustained them in their early years.

1. Matrix management, first names, and success-sharing are as essential to our productivity as executive dining rooms and unions are antithetical.

   a. Companies in this area use measures like stock purchase plans for all employees, stock options, early acquisition of responsibility, rapid upward mobility, and Friday afternoon beer busts to build motivation and a constructive work environment.

E. Finally, there is the entrepreneurial side to the Valley, a tradition in itself. It is as coupled to pragmatism -- (how can we make it better? what will sell?) -- as it is to risk and hoped-for rewards.

F. Practical thinking and risk-taking behavior are not limited to the start-ups in our industry, but permeate the whole area. With rapidly changing technologies, increasingly competitive markets and an environment rich in talent, the half-life of "conventional wisdom" is about 10 minutes.

IV. Transition

A. What I have just described is really an industrial ecosystem -- where life flourishes because of the interaction of many important sub-systems. It is a fragile balance to be sure, and, as with any set of resources, governmental action can work to strengthen or sabotage it.

V. Government Action: Don'ts

A. Two examples of current government activity that threaten the balance are the Simpson-Mazolli and export control proposals.

B. As I mentioned before, this area has become a mecca for technical talent and has thrived from the contributions of participants from across the globe.

1. °The first microprocessor, developed by Intel, was programmed by an Italian, Federico Faggin, who later went on to found Zilog, one of this area's major companies.

   °The first EPROM was developed by an Israeli working at Intel.

   °A Japanese engineer invented our 8080 microprocessor.

   °Aryeh Finegold, an Israeli, started Daisy Systems, a major CAD/CAE company.

   °Philip Hwang of Korea started Televideo.

   °Sirjang Lal Tandon, from India, is the head of Tandon Computers.

   °Currently, of all the new employees hired by Intel directly from universities, 80% of the Ph.Ds and 50% of the Master's level employees are not U.S. citizens.

2. By placing restrictions on the ability of U.S.-trained foreign workers to stay in this country, the Simpson-Mazolli legislation would create a drought of our most valuable resource, as detrimental to our industry's health as an extended dry spell is to growing crops.

C. Just as access to foreign talent is crucial to our R&D efforts, access to international markets is critical to our competitiveness. While national security interests of course dictate restrictions on sale of military products, extensions to commercial technology must be viewed with caution. For example, due in part to pending export-related legislation, Intel's application for a new bulk distribution license, (its most important export license), has still not been approved, after being submitted 14 months ago. Instead, extensions to our old distribution license continue to be granted. Meanwhile, newer export products and destinations not mentioned in the older license remain uncovered.

1. Closing markets works to lower and delay our R&D payoffs by decreasing total numbers of design wins and prolonging the dissemination of our most advanced technologies. This hurts our ability to finance future R&D and growth.

2. Military R&D is increasingly dependent on a vibrant commercial R&D base and a vibrant economy. Restricting exchange of products and ideas and lowering our export levels could be counterproductive.

3. Restrictions work to spread the notion that the U.S. is an unreliable supplier, which affects our overall trade image.

4. As high-tech industry gets more international, it becomes more important for foreign subsidiaries/plants to receive products from U.S. branches. Will exports like these get caught up in the export control efforts?

    a. For example, our bulk distribution license does not apply to sending our 80286 microprocessor-based products to our own design center in Israel. We must get an individual license each time because these products exceed the limit of a 20 million bits-per-second processing data rate set up by the Department of Commerce. The Department of Commerce set up this exemption from using a bulk distribution license to cover countries which did not sign the nuclear non-proliferation agreement (=Israel). We are not criticizing the intent of this ruling, but feel that the impact it has had on Intel's foreign R&D was not anticipated. Our 80286-based products represent our most current technology and are vital to developing tomorrow's products. Export delays, then, turn into R&D delays.

5. Increasing export restrictions creates another layer of bureaucracy, raising our handling costs and causing delays. This translates to lost business.

    a. Recently, Intel lost a systems sale to the People's Republic of China to the Japanese. It took us nine months to get our license processed and approved, as opposed to one month for the Japanese. As a result, by the time we had completed the paperwork, Japan had already delivered the product! This delay factor shows up in our export processing all over the world and gives an advantage to foreign competitors.

6. Restricting the flow of ideas and products makes for a closed society and is bad science. (military R&D is not as porductive.)

D. These two measures, then, could work to drive technology off-shore, which would weaken our competitive stance.

VI. Government Action: Do's

A. Three areas where the government has helped our industry maintain its leadership in innovation are tax laws relating to venture capital, the R&D tax credit, and tax treatment of employee education.

B. In 1978, Ed Zschau helped get the Steiger amendment passed and signed into law. The law reduced the effective tax rate on capital gains from 49% to 28%. Further tax cuts in 1981 lowered this rate to 20%.

1. The result has been that the amount of new money committed to venture capital pools went from $50-100 million per year in the 1970's to a 1983 amount of over $4 billion.

C. An important competitive advantage that the Japanese semiconductor industry has is that its cost of capital is at least 35% lower than ours. (Paine Webber study, 1982) Lower cost of capital means a lower rate of return on capital is required, which is one reason the Japanese can be so aggressive on pricing.

1. The R&D Tax Credit Act has worked to bridge the cost-of-capital gap by reducing the tax burden on that part of our retained earnings that is placed into R&D efforts.

2. The credit makes a big difference to the semiconductor industry. In 1983, for example, Intel spent $142 million on R&D, which is almost 13% of its revenues. The magnitude of our investment is repeated throughout the entire industry.

3. The credit, (especially if effective over a long period so that management can build it into plans), creates a great incentive to spend more on R&D over the long term. This is another area where the Japanese have had an advantage due to their government's policies.

    a. It should be noted, however, that the current credit applys only to marginal R&D spending, and has no or little impact in recessionary or low-growth periods.

4. Our industry's plowing-back of retained earnings (dividends are rare) and use of short-lived equipment means we do not realize some of the tax savings from recent tax laws and depreciation schedules that other industries do.

    a. Your own committee's analysis indicates that 1981 average effective tax rates on U.S. income for U.S. electronics companies were 50% higher than those of U.S. companies generally.

5. The R&D tax credit works in part to bring our industry's share of taxes more in line with other industries, as long as we are growing. It should be extended.

D. High-technology industries are becoming increasingly complex at all levels -- manufacturing processes, product architectures, and management structures. This complexity demands a workforce that is well-trained and whose knowledge keeps up with the pace of industrial change. An amendment to existing legislation, in effect from 1978-19[illegible], granted tax-exempt status to virtually all employee tuition reimbursement recognizing the value of employee education to the future of our industry.

1. Intel sees tuition reimbursement as a long-term investment -- over $750,000 in tuition costs were reimbursed in the 1982 school year.

2. By allowing the amendment to expire in 1983, Congress has created a double standard. The amendment provided tax-exempt status for courses which prepared employees for future, not just present job responsibilities. This created an incentive for entry-level, clerical and fab/assembly workers to take a variety of courses which would help move them into positions of greater responsibility. Now, with the amendment expired, tax-exempt status goes only to those taking classes which help meet present job responsibilities: this benefits managers and already-trained employees, but leaves lower-level workers out in the cold.

a. It is ironic that this blow to training employees for future responsibilities takes place in a time when "retraining" is very much in vogue. -- Does a person have to lose his job first in order to get training assistance?

3. The amendment recognized that widespread knowledge is important to our long-term growth. It should be reintroduced and passed.

VII. Conclusion

A. In this testimony, I have stressed ways that the government can give us the tools we need to compete, to create useful products, to continue our ability to provide jobs and to contribute to a strong economy.

B. Open access to talent and markets, incentives for R&D spending, and tax exemptions for employee education are measures that work to build in effective problem-solving capabilities at the company level, thereby reducing the need for expensive government bail-outs once problems have gone too far.

C. They also address what I like to call the "4 M's" critical to the success of "Silicon Valley" types of companies. The 4 M's are:

°Money (tax laws which support productive capital investments)

°Manpower (a strong educational system and environment which makes U.S.-trained foreign talent accessible.)

°Markets (no unnecessary export controls)

°Motivation (the ability to provide adequate financial, social, and personal rewards through a vibrant economyd and an attractive quality of life)

D. I look forward to other strategies that these hearings will unveil.

Representative LUNGREN. Thank you very much.

Our next witness is Mr. Lester Hogan, director and consultant to the president, Fairchild Camera & Instrument Corp.

STATEMENT OF C. LESTER HOGAN, DIRECTOR AND CONSULTANT TO THE PRESIDENT, FAIRCHILD CAMERA & INSTRUMENT CORP., MOUNTAIN VIEW, CA

Mr. HOGAN. Congressman Dan Lungren and members of the economic panel, I want to say that I feel honored to have the opportunity of coming to you here today and giving my advice about what has made Silicon Valley what it is. You have my statement, so I won't read it. Like Bob, I will try to summarize it.

I would like to start, however, by giving a resounding approval of what Bob has said. I did see an outline of what he was going to say and I've tried to avoid the particular subjects he covers and give my own view of these things. But, nevertheless, I do agree very wholeheartedly with every comment he has made.

In terms of the history of the valley, obviously the media has done an excellent job of describing it. We find as we travel around the world today, whether we're in the Far East or Latin America or Eupope, we find every politician, every journalist, every businessman, every engineer we contact knows more about the details of what has transpired here than perhaps we ourselves do.

So that I think one shouldn't bother about the details of the history, but should try to interpret what happened in that history to make this a rather unique place in the world. Obviously, even though you will find a lot of agreement between us, there are some differences between our points of view. That arises because we've individually had different experiences.

I've had quite a different career path than either Regis McKenna or Bob Noyce and I think it's natural that I interpret the history to fit the facts as I know them, and for them to interpret the facts as they know them. I began my career at Bell Telephone Laboratories in 1950. And I often think of how lucky a man can be to begin his professional career in Bell Telephone Laboratories in 1950, about 18 months after the transistor was invented. And that was the year that IBM introduced to the world the IBM 701, which was the world's first commercially available digital stored-program computer.

I learned many things at Bell Labs. One of the most valuable things I learned while I was there was that if we had set up a panel to write a research agenda for the next 10 years using the very brightest people that were available at Bell Labs it would have been a disaster had anyone attempted to follow it.

In 1950 at Bell Labs there was absolutely no way to predict the kinds of talents that were required in order to bring us from that very, very primitive beginning of the point contact transistor to the place we find ourselves today with a half a million transistors on a chip of silicon, with a microprocessor that has brought the logic power of then huge computers down to where we can buy them as educational things for our children in the home.

The contributions were not all made by electrical engineers; the contributions were made by physicists, electrical engineers, chemists, metallurgists, mechanical engineers, optical engineers, electron beam experts, and micro-photography experts. And there was no way one could imagine that we would need expertise from such a wide field of science and technology.

As I look back at those early years at Bell Telephone Laboratories, I think the reason that we look at men like Mervin Kelley as truly a giant in our field today is the fact that somehow he understood this, and somehow he was able and willing to finance basic research in all of these areas of endeavor when no one could justify that research on any hard analysis in those days.

If I learned nothing else, somehow by example alone I learned this very fundamental concept just by watching Mervin Kelley, the way he handled himself at Bell Laboratories. And I think that if Congress is truly interested in strengthening the scientific basis upon which our technology is founded I think one of the most important things you can do is to help support the university systems in the United States.

As Bob pointed out, his No. 2 item that attracted him to Silicon Valley—and his contributions have been so great that I don't think there would be a Silicon Valley if Bob Noyce hadn't come—but his No. 2 issue was that one of the things here was great universities, which are factories of knowledge.

And this is a thing that you should think very seriously about. We look back in the history of the United States with the land grant colleges. We had a great inheritance from our grandfathers in that somehow they found the money and the resources to build for us the greatest university system in the world.

Somehow today we find that government, both the national and State governments, put this at the bottom of the priority list when it comes to writing the budget. And it gets cut off in the final analysis, because there doesn't appear to be enough funds to maintain the university system with the same high caliber that it had when we inherited it from our grandfathers.

The other thing I would urge on Congress is to take the lesson that I learned at Bell Labs from Mervin Kelley and don't place too much bureaucratic restriction on, and supervision of, the research that is done in the university system. And I say university system, in particular, because I think research—especially any kind of financed research in industry, be it the aerospace industry or what have you—should be mission-oriented kind of research.

We ourselves should support the ongoing research which is not mission oriented, and I don't think that should be supported in industry by the Federal Government. But the universities depend very much upon your help.

So that as one looks around this valley one finds there are many, many factors that brought about this success of the valley. And while there are certainly other centers in the United States—that around Route 128, and I was a professor at Harvard University for 5 years so I'm also familiar with that and it certainly has been a very important center of high technology, but in terms of magnitude, in terms of the real breakthroughs, it probably has not achieved the fame nor the output of our valley here. There are many others that promise to have great potential in the near future.

Another thing that is important in the valley is the mobility of people. A lot of large corporations take a dim view of mobility of people, but one finds that most of these entrepreneurial companies are founded by a half a dozen or so very key and important individuals. They would not have succeeded had it not been for this half dozen individuals that went to it.

If they really do achieve that initial success and begin on the curve of growth, it is very essential for them to find other people. A lot of these come directly from the university, but a lot of them come from larger corporations in the area. And the larger corporations really have no choice except to become a training ground.

As the entrepreneurial companies grow it is essential that they hire more people to fill in their ranks with talents that they didn't have originally, and also to give them people that are necessary for growth. Now, if the source of these people or the incentives which can be offered by the fledgling companies are inhibited, then I think the new, daring, innovative companies would suffer, and I think many more would fail.

Congress has put roadblocks in this pathway. Most recently, even though we have achieved a reduced capital gains tax which has been extremely important to the flow of venture capital, we have a restriction on the size of stock options that can be given to such people. The restriction is a value of $100,000 per year to be a qualified stock option.

I really think these limits should be removed and let the free market and let the shareholders of the company exert the discipline that is necessary in this field.

I would like to speak just briefly on the proposals that have been discussed and the need of America for a national industrial policy. For those who don't understand how the system works, it appears that this must be a good thing to do. Or on the face of it, a policy that recognizes the importance of certain new and emerging sectors of our industry certainly could do no harm and that must be a worthwhile effort.

But, you will find, I think, that most of us in Silicon Valley are very strong supporters of the free enterprise system; we're very strong supporters of free reciprocal trade. And I pause to make certain you heard the term "reciprocal trade," along with free trade. We are very strong supporters of the unfettered mobility of people between jobs. And we are strong supporters of a tax system that recognizes the unusal risk taken by both venture capitalists in taking their money out of bonds or stocks or real estate and taking the big gamble of backing a company.

Because companies like Intel, like ROLM, like Apple Computer get so much publicity, I think the average citizen kind of believes this is a one-way street: If you have a couple of bucks and back an entrepreneurial company it's a way to riches, just a one-way street.

But, it turns out that, while the percentage of companies founded in Silicon Valley that succeed changes with time, it's an oscillating sort of thing, It's not that it increases with time. But right now, today, I believe the number is close to 5 percent. Regis would probably have a better number than I have right there, but it certainly isn't more than 10 percent.

And the last thing that any of us want is to save those 90 or 95 percent that should fail. They must have the right to fail. There are many, many reasons for that.

First, the private enterprise system cannot work at all, cannot be intellectually defended, if the companies that are mismanaged are not permitted to fail. The opportunity to both succeed and to fail, I think, are necessary prerequisites to make our private enterprise system the most efficient in the world.

It is indeed a necessary cleansing action to remove the incompetent, the inefficient, and the noninnovative company from the scene of action. One cannot justify the necessary potential rewards to both the venture capitalist and the entrepreneur if one takes away the risk, if the risk of total failure is not a real and present possibility.

I really fear that if there were a national industrial policy, the group that was set up to administer it would find it essential to save those failing 95 percent of the companies. And then I think having removed the risk that is now present in entrepreneurial activities, it would proceed to the obvious conclusion of also removing the necessary rewards that are required to bring the truly daring, the truly innovative, the truly competent people into this field of activity.

I think an activity then, you see, would penalize the successful entrepreneur and support the unsuccessful entrepreneurs.

Now, this does not mean that there is little that Congress can do. Bob referred to the four M's, the first one being money. We say in the 1969 tax law, which greatly increased the capital gains tax, that venture capital dried up in the valley. There were very few companies that were founded from 1969 to 1978 when, through Congressman Ed Zschau's help, this industry was able to explain the problem to Congress and Congress took very rapid action in changing that law.

So there is a case study available to you on upper and lower limits in capital gains taxes that are very, very clear, that shows how large it has to be to cut off the flow of money and, again, the limit as it is today, where the money seems to be readily available.

However, I do believe that some of the small companies today are failing because it is becoming difficult for them to attract the very best people as they move on into a growth phase. So I think if one were to look at this limit on yearly stock options it would be a very worthwhile thing to do.

Finally, I think the successful-but-still-struggling small company needs tax laws that encourage it to invest in the future. I think the best, and perhaps the only, way the U.S. Congress can contribute to this activity is through tax incentives. I think the most generous research and development tax credits that you can put together is the wisest action that you can take at this particular point.

I know that Bob Noyce has gone much further in his thoughts about this than anyone. He and I have discussed it in detail. You need the opportunity to spend more time with Bob Noyce, to listen to his plan in some detail. After managing two of the most successful semiconductor companies on the face of the Earth, Bob is certainly a good spokesman for our industry. And he has evolved a potential plan for R&D tax credits that I think would make a major difference in our industry.

To me, if nothing else came from these hearings except a will on your part to support Bob's plan, then in less than 5 years after such enactment you could look back with very great pride on the surging entrepreneurial activities throughout the United States and know that your committee was a prime factor in yet another miracle for the rest of the world to ponder. Thank you very much.

[The prepared statement of Mr. Hogan follows:]

PREPARED STATEMENT OF C. LESTER HOGAN

CONGRESSMAN DAN LUNGREN AND MEMBERS OF THE JOINT ECONOMIC COMMITTEE OF THE UNITED STATES CONGRESS; IT IS INDEED A PLEASURE AND AN OPPORTUNITY TO BE ABLE TO APPEAR BEFORE YOU TODAY AND DESCRIBE FOR YOU SOME OF THE HISTORICAL FACTORS THAT HAVE MADE SANTA CLARA COUNTY THE RECOGNIZED FOUNTAINHEAD OF HIGH TECHNOLOGY ELECTRONICS THROUGHOUT THE WORLD. TWENTY YEARS AGO, THE NAME SILICON VALLEY WAS ALREADY WELL KNOWN IN THE ELECTRICAL ENGINEERING PROFESSION, BUT THE AVERAGE INTELLIGENT LAYMAN BELIEVED IT WAS A REFERENCE TO CAROL DODA AND HER RISE TO FAME ABOUT THAT TIME. HOWEVER, TODAY, I BELIEVE NO WELL READ CITIZEN OF THIS WORLD CONFUSES SILICON WITH SILICONE AND, WHILE IT MAY SMACK OF ARROGANCE, I DO BELIEVE SILICON VALLEY HAS LONG AGO ECLIPSED THE FLEETING FAME OF BROADWAY STREET IN SAN FRANCISCO.

I ALSO BELIEVE THAT THE NEWS MEDIA OF MOST COUNTRIES OF THE WORLD HAVE DONE A RATHER GOOD JOB OF DETAILING SOME OF THE HISTORY OF OUR PRODUCTIVE VALLEY SO THAT EVERYONE KNOWS THE BASIC STORY OF FRED TERMAN'S ROLE, AS PROVOST AT STANFORD UNIVERSITY AND BEFORE THAT AS DEAN OF ENGINEERING. THEY ALSO KNOW THE STRONG LINKS AND INTERDEPENDENCE BETWEEN UNIVERSITIES SUCH AS STANFORD AND THE UNIVERSITY OF CALIFORNIA AT BERKELEY, THAT HAS SYNERGISTICALLY FUELED THIS UNIQUE PHENOMENON.

WHETHER ONE TRAVELS IN EUROPE, LATIN AMERICAN, OR THE FAR EAST, EVERY POLITICIAN, EVERY GOVERNMENT OFFICIAL, EVERY ENGINEERING PROFESSOR, EVERY INDUSTRIALIST, EVEN EVERY JOURNALIST, SEEMS TO KNOW THE HISTORICAL EVENTS AS WELL AS ANY OF US THAT HAVE LIVED IN THE VALLEY FOR 20 OR 30 YEARS. SO I SUSPECT THAT ANOTHER DETAILING OF THE HISTORY AT THIS TIME IS NEITHER EXCITING OR PRODUCTIVE. WHAT IS, PERHAPS, MORE USEFUL, IS TO ATTEMPT TO INTERPRET THIS HISTORY OR TO TRY TO UNDERSTAND WHY THESE PARTICULAR HISTORICAL FACTS LEAD TO SUCH A UNIQUE PHENOMENON IN SANTA CLARA VALLEY AND NOT SOME OTHER PLACE.

I MUST BEGIN THIS DISCUSSION, HOWEVER, BY WARNING EVERYONE ASSEMBLED HERE THAT TO ATTEMPT AN INTERPRETATION OF HISTORY IS A VERY RISKY BUSINESS. IN REALITY, I HAVE NEVER MET ANYONE YET WHO IS QUITE CAPABLE OF THIS FORMIDABLE TASK. PART OF THE PROBLEM IS THAT EVEN THOSE OF US WHO HAVE BEEN ENGAGED IN THIS HISTORICAL PERSPECTIVE FOR MANY YEARS HAVE NOT ALL HAD EXACTLY THE SAME EXPERIENCE. IT IS ONLY NATURAL THAT EACH OF US INTERPRET THE HISTORICAL FACTS IN A WAY THAT EXPLAINS OUR OWN PERSONAL EXPERIENCES AND THUS WE EACH HAVE OUR OWN INTERPRETATIONS WHICH MUST DIFFER AT LEAST IN SOME SMALL WAY AND SOMETIMES THEY DIFFER IN RATHER SIGNIFICANT WAYS.

IT IS REMINISCENT OF THE STORY WHICH FREEMAN TYSON RELATED IN HIS RECENT BEAUTIFUL BOOK ENTITLED, "DISTURBING THE UNIVERSE". IN THIS BOOK, HE DESCRIBES A CONVERSATION THAT TOOK PLACE BETWEEN HANS BETHE AND LEO SZILARD BACK IN THE 1940's. THESE TWO NOBEL PRIZE WINNING PHYSICISTS HAD THE OPPORTUNITY OF SPENDING THE DAY TOGETHER DISCUSSING THE ENORMOUS PROGRESS THAT HAD BEEN MADE IN MAN'S UNDERSTANDING OF BOTH THE ATOM AND THE UNIVERSE DURING THEIR ADULT LIFE, AND CONTINUED DISCUSSING SOME OF THE STILL UNSOLVED PROBLEMS AND THEIR INDIVIDUAL FEELINGS AS TO WHICH DIRECTION PROGRESS MIGHT BE MADE IN THE YEARS TO COME. AT THE END OF THE DAY, LEO SZILARD TOLD HANS BETHE THAT HE HAD BEEN KEEPING A DAILY DIARY FOR MORE THAN A DECADE AND THAT IT WAS HIS INTENT BEFORE RETIRING TO RECORD IN SOME DETAIL THE DISCUSSIONS WHICH THE TWO OF THEM HAD HAD THAT DAY. HANS BETHE REMARKED, "LEO, I THINK THAT IS A WONDERFUL THING YOU ARE DOING AND I CAN'T WAIT UNTIL YOU PUBLISH THIS DIARY." WHEREUPON LEO RETORTED, "OH, I HAVE NO INTENTION OF EVER PUBLISHING MY DIARY." BETHE WAS A LITTLE NON-PLUSSED AND SAID, "FOR HEAVEN"S SAKE, WHY DO YOU KEEP SUCH A RECORD THEN." LEO RESPONDED, "OH WHEN THIS EXCITING PERIOD HAS COME TO AN END, I WANT TO MAKE CERTAIN THAT GOD KNOWS THE TRUTH AS TO JUST WHAT HAPPENED." HANS ANSWER WAS, "LEO, DON'T YOU REALLY THINK GOD KNOWS THE TRUTH, WITHOUT BENEFIT OF YOUR DIARY?" LEO SAID, "I AM CERTAIN GOD KNOWS THE TRUTH, BUT I DON'T THINK HE KNOWS MY VERSION OF IT."

SO IT IS WITH EACH OF US WHO WOULD ATTEMPT TO INTERPRET THE HISTORY OF SILICON VALLEY FOR ANYONE TODAY. IT MAY NOT BE THE SAME INTERPRETATION GOD WOULD GIVE, BUT IT IS OUR OWN VERSION OF THAT STORY.

MY CAREER PATH HAS BEEN QUITE DIFFERENT FROM THAT OF BOB NOYCE OR REGIS MCKENNA, OR KEN OSHMAN, OR ANY OF THE OTHERS YOU WILL HEAR FROM BOTH TODAY AND TOMORROW. HENCE, MY EXPERIENCES HAVE BEEN DIFFERENT, AND THUS MY INTERPRETATIONS MUST BE SOMEHOW SLANTED BY THE EXPERIENCES I HAVE HAD. I BEGAN MY CAREER AT BELL TELEPHONE LABORATORIES IN 1950 AND QUICKLY WAS ABLE TO LIST AS BOTH ACQUAINTANCES AND FRIENDS MEN LIKE MERVIN KELLEY, BILL SHOCKLEY, JOHN R. PIERCE, JOHN BARDEEN, BILL PFANN, JACK MORTON, BILL SCAFF, CHARLIE KITTEL, BILL BAKER, AND MANY OTHERS WHOSE NAMES SHINE IN THE ENTIRE STORY OF ELECTRONICS AS GIANTS WHO FOSTERED THE FOUNDATION UPON WHICH EACH OF US HAVE BUILT OUR LIVES. I LEARNED SO MANY THINGS AT BELL LABS THAT I COULD WRITE AN ENTIRE BOOK ABOUT IT. BUT ONE OF THE MOST IMPORTANT THINGS I LEARNED WAS THAT IF THE BRIGHTEST PEOPLE IN THE WORLD HAD BEEN ABLE TO WRITE A RESEARCH AGENDA FOR THE NEXT TEN YEARS IN ORDER TO BRING MOST RAPIDLY INTO BEING THE FUNDAMENTAL DISCOVERIES THAT WOULD POUR OUT UPON MANKIND IN THE NEXT TEN YEARS, THEY WOULD HAVE FAILED MISERABLY. THERE WAS NO WAY TO ANTICIPATE THE NEED FOR, AND THE ULTIMATE CONTRIBUTIONS OF, THE METALLURGISTS, CHEMISTS, MECHANICAL ENGINEERS, OPTICAL ENGINEERS, ELECTRON BEAM ENGINEERS, MICRON PHOTOGRAPHY EXPERTS, AND SO ON.

THE MAIN CONTRIBUTION OF GIANTS LIKE MERVIN KELLEY AND BILL BAKER WERE THEIR ENORMOUS FORESIGHT IN SUPPORTING BASIC RESEARCH THAT, AT THE TIME, COULD NOT BE JUSTIFIED BY ANY HARD ANALYSIS, SIMPLY BECAUSE THEY HAD ALSO LEARNED THIS SAME LESSON AND, BY EXAMPLE, THEY TAUGHT THIS VERY FUNDAMENTAL CONCEPT TO ME.

THE TRANSISTOR COULD NOT HAVE BEEN INVENTED IN ANY OTHER LABORATORY IN THE WORLD AT THAT TIME AND THE SOLUTION OF THE HUNDREDS OF NEARLY IMPOSSIBLE PROBLEMS THAT FACED THIS INFANT DEVICE COULD NOT HAVE BEEN ACHIEVED BY ANY OTHER LABORATORY IN THE WORLD IN THE EARLY 1950's BECAUSE EVERY OTHER LABORATORY FOCUSED ITS RESEARCH ON PROBLEMS THAT APPEARED TO BE MOST RELEVANT TO THE WELL BEING OF THOSE WHO ULTIMATELY HAD TO SUPPORT THE REASEARCH. THIS WAS TRUE OF EVERY NATIONAL LABORATORY AND EVERY LABORATORY IN THE PRIVATE DOMAIN.

OF ALL THE SPONSORING AGENCIES OF THE FEDERAL GOVERNMENT THAT SUPPORTED ACADEMIC RESEARCH AT THE CLOSE OF WORLD WAR II, ONLY THE OFFICE OF NAVAL RESEARCH PERMITTED ENOUGH FREEDOM OF THEIR ACADEMIC PARTNERS SUCH THAT IF BELL LABS HAD NOT PRE-EMPTED THEM, THEN SOME UNIVERSITY SUPPORTED BY ONR MIGHT EVENTUALLY HAVE ACHIEVED THE SAME GOAL.

SO IF CONGRESS IS TRULY INTERESTED IN STRENGTHENING THE SCIENTIFIC BASE UPON WHICH OUR TECHNOLOGY IS FOUNDED, THEN I SUGGEST ONE OF THE MOST USEFUL THINGS YOU CAN DO IS TO REMOVE SOME OF THE BUREAUCRATIC SUPERVISION THAT RIDES HERD OVER THE GOVERNMENT SPONSORED RESEARCH IN AMERICA'S UNIVERSITIES.

SILICON VALLEY IS, OF COURSE, YET ANOTHER PHENOMENON. WHILE THERE ARE INDEED OTHER GREAT CENTERS OF TECHNOLOGICAL ACHIEVEMENT, BOTH WITHIN OUR OWN COUNTRY AND IN MANY OTHER COUNTRIES OF THE WORLD, IT STILL REMAINS A FACT THAT NO OTHER CENTER IS SO HIGHLY ACCLAIMED THROUGHOUT THE WORLD AND CERTAINLY NO OTHER SINGLE CENTER CAN COME CLOSE TO THE RECORD OF ACHIEVEMENT WITHIN THIS VALLEY. IT IS, THEREFORE, QUITE NATURAL FOR ANY THINKING INDIVIDUAL TO ATTEMPT TO UNDERSTAND THE FACTORS THAT CONTRIUBTED TO THIS REMARKABLE ACHIEVEMENT AND THUS TRY TO REPRODUCE ITS CLONE IN MANY OTHER PARTS OF OUR COUNTRY.

THERE ARE DOZENS OF FACTORS THAT ARE ESSENTIAL TO THE SUCCESS OF THIS VALLEY. WHILE MOST OF US APPEARING ON THIS PANEL WOULD LIST THESE FACTORS WITH DIFFERENT PRIORITIES, I KNOW THAT OUR LISTS WOULD ALSO BE VERY SIMILAR. CERTAINLY THE CLOSE RELATION THAT EXISTS BETWEEN OUR INDUSTRY AND THE UNIVERSITIES IN THE AREA IS AN ESSENTIAL FACTOR. THE EXISTENCE OF AN UNUSUAL BREED OF VENTURE CAPITALISTS THAT EXIST IN THIS AREA HAS BEEN AN EXTREMELY IMPORTANT FACTOR. BY THIS, I MEAN THAT IN THIS AREA THE VENTURE CAPITALISTS BRING MUCH MORE THAN MONEY TO THE PARTY. THEY BECOME ACTIVE, CONTRIBUTING PARTNERS TO THE ENTREPRENEURIAL VENTURES. EACH OF US CAN REFER TO MANY OUTSTANDING ENTREPRENEURIAL COMPANIES IN THIS AREA WHOSE SUCCESS RESTS SOLIDLY ON THIS PARTICIPATIVE INVESTMENT PHILOSOPHY THAT IS QUITE UNIQUE IN THE VALLEY.

WHILE MANY LARGE CORPORATIONS TAKE A VERY DIM VIEW TO THE MOBILITY OF PEOPLE THAT EXISTS IN THIS AREA, IT IS A NECESSARY INGREDIENT TO THE SUCCESS OF MOST ENTREPRENEURIAL VENTURES. AS THESE VENTURES FLOURISH AND GROW, IT IS ESSENTIAL THAT COMPETENT PEOPLE BE ADDED TO THE ORIGINAL TEAM TO FILL IN MISSING TALENTS AND TO SUPPORT THE GROWTH OF THE COMPANY. THE LARGER CORPORATIONS FIND IT NECESSARY TO BECOME A TRAINING GROUND FOR THESE PEOPLE. NEW VENTURES FIND IT POSSIBLE TO LURE THESE INDIVIDUALS TO THEIR SMALLER ORGANIZATIONS WITH STOCK OPTIONS THAT HAVE GREATER UPSIDE POTENTIAL THAN THOSE WHICH CAN BE OFFERED BY THE LARGER CORPORATIONS.

IF THE SOURCE OF SUCH PEOPLE OR THE INCENTIVES WHICH CAN BE OFFERED BY THE FLEDGLING COMPANIES ARE INHIBITED, THEN THE NEW, DARING, INNOVATIVE COMPANIES WOULD SUFFER AND MANY MORE WOULD FAIL. CONGRESS HAS CONTINUOUSLY PUT ROADBLOCKS IN THIS PATHWAY BY RESTRICTING THE SIZE OF STOCK OPTIONS THAT CAN BE GIVEN TO SUCH PEOPLE. THESE LIMITS SHOULD BE REMOVED AND LET THE FREE MARKET AND THE SHAREHOLDERS OF THE COMPANY EXERT WHATEVER DISCIPLINE IS NECESSARY.

ONE OF THE PROPOSALS THAT HAS BEEN DISCUSSED IN RECENT YEARS IS THE NEED IN AMERICA FOR A NATIONAL INDUSTRIAL POLICY. FOR THOSE WHO DO NOT UNDERSTAND HOW THE SYSTEM WORKS, IT APPEARS THAT SOME SORT OF NATIONAL INDUSTRIAL POLICY THAT RECOGNIZES THE IMPORTANCE OF CERTAIN NEW AND EMERGING SECTORS OF OUR INDUSTRY, COULD DO NO HARM AND MUST BE A WORTHWHILE EFFORT.

YOU WILL FIND THAT MOST OF US IN SILICON VALLEY ARE STRONG SUPPORTERS OF THE FREE ENTERPRISE SYSTEM, FREE RECIPROCAL TRADE, UNFETTERED MOBILITY OF PEOPLE BETWEEN JOBS, AND A TAX SYSTEM THAT RECOGNIZES THE UNUSUAL RISK TAKEN BY VENTURE CAPITALISTS, AND HENCE, MAKES THE POTENTIAL REWARD FOR SUCCESS SUFFICIENT ENOUGH TO ATTRACT THEIR MONEY AWAY FROM REAL ESTATE INVESTMENTS, BONDS OR STOCKS IN LARGER, SAFER COMPANIES. IN ADDITION, WE FEEL THAT INDIVIDUALS, WHO ARE WILLING TO LEAVE THE SECURITY OF LARGER CORPORATIONS, AND RISK THEIR FUTURE ON THE CONFIDENCE THAT THEY CAN HELP BUILD ANOTHER

SUCCESSFUL NEW COMPANY, MUST HAVE THE OPPORTUNITY OF ACHIEVING FINANCIAL SUCCESS THAT IS CONSIDERABLY GREATER THAN THE LARGE STABLE COMPANIES CAN OFFER.

HOWEVER, THE PRIVATE ENTERPRISE SYSTEM CANNOT WORK IF COMPANIES THAT ARE MISMANAGED ARE NOT PERMITTED TO FAIL. THIS OPPORTUNITY TO BOTH SUCCEED AND TO FAIL ARE NECESSARY PREREQUISITES TO MAKE OUR PRIVATE ENTERPRISE SYSTEM THE MOST EFFICIENT SYSTEM IN THE WORLD. IT IS INDEED A NECESSARY CLEANSING ACTION TO REMOVE THE INCOMPETENT, THE INEFFICIENT, AND THE NON-INNOVATIVE COMPANY FROM THE SCENE OF ACTION. ONE CANNOT JUSTIFY THE NECESSARY POTENTIAL REWARDS TO BOTH THE ENTREPRENEUR AND HIS VENTURE CAPITAL PARTNER UNLESS THE RISK OF TOTAL FAILURE IS A REAL AND PRESENT POSSIBILITY.

WE FEAR THAT ANY ORGANIZED GOVERNMENT SPONSORED NATIONAL INDUSTRIAL POLICY WOULD FIRST GIVE AID TO THE FAILING ORGANIZATIONS THAT SHOULD FAIL, AND THEN HAVING REMOVED THE RISK FROM SUCH ENTREPRENEURIAL ACTIVITIES, IT WOULD PROCEED TO ITS OBVIOUS CONCLUSION OF ALSO REMOVING THE NECESSARY REWARDS FOR SUCCESS.

SUCH AN ACTIVITY WOULD PENALIZE THE SUCCESSFUL ENTREPRENEURS IN ORDER TO SUPPORT THOSE THAT DESERVE TO FAIL. AGAIN, THIS DECISION IS FAR BETTER MADE BY THE FREE MARKET. THE WISE VENTURE CAPITALISTS WILL, OF THEIR OWN ACCORD, SAVE THE FALTERING COMPANY THAT DESERVES TO BE SAVED AND WILL ALLOW THE OTHERS TO FAIL.

THE PUBLIC SEES ONLY THE SUCCESSFUL COMPANIES IN OUR VALLEY AND SOMEHOW BELIEVE THAT ALL THE COMPANIES THAT ARE FOUNDED FOLLOW THIS SAME SUCCESS STORY. SUCCESS STORIES SUCH AS ROLM, APPLE COMPUTER, INTEL, HEWLETT-PACKARD, AND OTHERS ARE SO HIGHLY PUBLICIZED THAT IT APPEARS THAT THIS IS A ONE WAY STREET. HOWEVER, TODAY FEWER THAN FIVE PERCENT OF THE ENTREPRENEURIAL COMPANIES FOUNDED IN SILICON VALLEY SUCCEED. IN MY OPINION, IT WOULD BE A TERRIBLE MISTAKE FOR OUR GOVERNMENT TO ATTEMPT TO SAVE THE 95 PERCENT THAT FAIL.

SILICON VALLEY GREW AND PROSPERED WITHOUT A NATIONAL INDUSTRIAL POLICY. I SINCERELY BELIEVE THAT SUCH A POLICY WOULD HURT OUR INDUSTRY AND ULTIMATELY DESTROY SILICON VALLEY.

THIS DOES NOT MEAN THAT CONGRESS CAN DO NOTHING TO HELP. QUITE THE CONTRARY. THE 1969 TAX LAW INCREASED THE CAPITAL GAINS TAX SO MUCH THAT VENTURE CAPITAL DRIED UP IN THE VALLEY. THE RISKS WERE TOO GREAT FOR THE POTENTIAL REWARDS. VERY FEW NEW COMPANIES WERE FOUNDED IN THE 1970-1978 TIMEFRAME. CONGRESS RECOGNIZED THIS PROBLEM AND REDUCED THE CAPITAL GAINS TAX AND SUDDENLY MONEY STARTED POURING OUT OF COFFERS AT AN UNPRECEDENTED RATE. SO THERE IS A CASE STUDY AVAILABLE TO EACH OF YOU THAT DEFINES SOME UPPER AND LOWER LIMITS ON CAPITAL GAINS TAX THAT PERMITS THE FOUNDING OF NEW COMPANIES. IT APPEARS THAT VENTURE CAPITALISTS ARE BEING ADEQUATELY REWARDED OR THEY WOULD NOT BE OFFERING TO FINANCE THE HUNDREDS OF NEW COMPANIES THAT HAVE BEEN FORMED SINCE THE 1978 TAX LAW.

HOWEVER, IT IS MY BELIEF THAT SOME OF THE SMALL COMPANIES ARE FAILING TODAY BECAUSE IT IS BECOMING INCREASINGLY DIFFICULT FOR SMALL COMPANIES TO ATTRACT THE VERY BEST PEOPLE TO SUPPLY THE BRAINS THAT ARE NECESSARY TO SUPPORT THEIR INITIAL GROWTH PHASE WHEN THE COMPANY HAS ESTABLISHED AN INITIAL GROWTH PATTERN. THE LIMIT OF YEARLY STOCK OPTIONS THAT CANNOT EXCEED A MARKET VALUE OF $100,000.00 IS NOT ENOUGH TO LURE THE BEST PEOPLE FROM THE COMFORT AFFORDED BY THE LARGER CORPORATIONS.

FINALLY, THE SUCCESSFUL BUT STILL STRUGGLING SMALL COMPANY NEEDS TAX LAWS THAT ENCOURAGE IT TO INVEST IN THE FUTURE. THE BEST, PERHAPS THE ONLY WAY, THE U.S. CONGRESS CAN CONTRIBUTE TO THIS ACTIVITY IS THROUGH TAX INCENTIVES. THE MOST GENEROUS RESEARCH AND DEVELOPMENT TAX CREDITS THAT YOU CAN PUT TOGETHER IS THE WISEST ACTION YOU CAN TAKE AT THIS POINT IN TIME. PLEASE DON'T SUPPLY R&D DOLLARS TO ANY COMPANY. THE COMPANY MUST BE MOTIVATED TO SPEND ITS OWN MONEY. I KNOW BOB NOYCE INTENDS TO DISCUSS THIS SUBJECT IN MORE DETAIL. I AM VERY FAMILIAR WITH THE DETAILS OF THE PLAN HE HAS EVOLVED

AFTER MANY YEARS OF MANAGING TWO OF THE MOST SUCCESSFUL SEMICONDUCTOR COMPANIES ON THE FACE OF THE EARTH. I AGREE WHOLEHEARTEDLY WITH HIS PLAN AND HONESTLY BELIEVE THAT IT WOULD GIVE A SHOT IN THE ARM TO OUR SUCCESSFUL ENTREPRENEURS THAT CANNOT BE IMAGINED BY ANY OF US TODAY. MY PLEA IS THAT YOU LISTEN CAREFULLY TO HIS SUGGESTED PLAN. IT APPEARS TO ME THAT IF NOTHING ELSE CAME FROM THESE HEARINGS EXCEPT A WILL ON YOUR PART TO SUPPORT HIS PLAN FOR R&D TAX CREDITS, THEN IN LESS THAN FIVE YEARS AFTER SUCH ENACTMENT, YOU COULD LOOK BACK WITH PRIDE ON THE SURGING ENTREPRENEURIAL ACTIVITIES THROUGHOUT THE UNITED STATES AND KNOW THAT YOUR COMMITTEE WAS A PRIME FACTOR IN YET ANOTHER MIRACLE [illegible]. THE REST OF THE WORLD TO PONDER.

Representative LUNGREN. Thank you very much.

Now we'll hear from Mr. Regis McKenna, president of Regis McKenna Public Relations, Palo Alto.

STATEMENT OF REGIS McKENNA, PRESIDENT, REGIS McKENNA PUBLIC RELATIONS, PALO ALTO, CA

Mr. McKENNA. Good morning and welcome to Silicon Valley.

I have been working in Silicon Valley for about 20-some years and I have been fortunate to work with and serve people like Bob Noyce and have worked with possibly over 100 start-up companies, including Intel, Apple, Tandem, ROLM, Genentech, and many others. I have lived in the city council, along with John Mercer, who helped to organize the meeting this morning.

I have a prepared statement and I'd like to make some excerpts from that. Silicon Valley, as I think has been mentioned, has certainly captured the imagination of the world. North of Moscow near Zelonograd is an area that the Soviets refer to as their Silicon Valley. The Japanese have dubbed Kyushu, the southernmost main island, as Silicon Island. There are Silicon Valleys in Brazil, Poland, just about every place in the world, Canada. There is a Silicon Prairie, I think, in Texas that's growing up. There's a Silicon Desert in Arizona, and I recently heard that Oregon has its Silicon Forest.

Silicon Valley is a symbol of innovation, growth, entrepreneurship, the prosperous future of high technology; we're hopeful that it presents an opportunity for new jobs, and certainly it's a symbol of the coming age of information. More than anything else, Silicon Valley is probably a state of mind, since we include companies such as Genentech and Cetus and others in this area as Silicon Valley companies, and they reside somewhere about 50 miles north of here.

But all of this attention on Silicon Valley often is misunderstood. I think that the media and the world tends to focus only on the innovation and on its failures and we tend not to see where and how Silicon Valley has come about.

It should be understood that all of Silicon Valley's companies, or at least most of Silicon Valley's companies, are developers. They are the D in the R&D. Drawing upon basic research which is largely funded and done by universities and major labs in the United States and upon applied research which is funded and done largely by large corporations in the United States, small companies in Silicon Valley commercialize technologies and prepare them for production and markets.

As Mr. Hogan pointed out, in this feverish world of high technology short-term success does not guarantee long-term success. From basic research to markets may take 10 to 20 years or more. I might note that antibiotics took 30 years, and the zipper took 30 years.

The return on that investment is achieved only when companies own the resulting markets that they develop. The return on investment is not only measured by the return on stockholders' equity, but also on the return on the social investment; that is, the taxes that we have paid for that basic research, the taxes the corporations have paid and the moneys that they have invested in applied research and in the development of these industries.

And that return, that social return, is only achieved whenever these new industries survive and own the markets in which they participate.

I'd like to point out a few factors that I have observed that I think have made Silicon Valley successful, the first one being the semiconductors and the geography in which it resides. Obviously, the name "Silicon Valley" is derived from the semiconductor industry and from the geography itself.

We can trace almost every significant innovation in Silicon Valley to semiconductors. We can also trace its origins to the patriarchs who began that industry. According to Dataquest, the total worldwide semicondutor market in 1983 was $18.7 billion. Companies with headquarters in Silicon Valley generated 18 percent of that number.

However, they generated probably twice that amount in terms of their ideas, their innovations, and their patents. By 1987 the world semiconductor market is expected to be over $41 billion. The integrated circuit, the microprocessor and the semiconductor memory were launched here and they are the heart of every electronic game, toy, computer, satellite communication system, microwave oven, cash register, telephone, energy system, and weapon system that we know of. And hundreds of such semiconductor products come forth every year to support these kinds of applications.

In fact, the microprocessor that was launched here by Intel Corp. created the personal computer and the small business marketplace. According to Dataquest, total world sales in 1983 of those two industries was over $17 billion and by 1987 total sales will reach $62.2 billion. You will note that those two small industries are larger than the semiconductor industry itself. And we could no doubt show you many, many other industries that fall into similar categories.

The semiconductor industry is a creative and dynamic industry; with imagination, risk, and entrepreneurial spirit this technology is readily put to work. And that's exactly what ROLM, Tandem, Apple, Convergent, Amdahl, Altos, TeleVideo, Measurex, and hundreds of others in the valley are doing: Putting semiconductors to use.

Silicon Valley is a relatively small area walled in by natural boundaries and these boundaries create somewhat of a global village, a village in which social, political, and economic networks rapidly develop and become interdependent. The industry and the geography bring together people with similar interests, backgrounds and technology perspectives into a common melting pot.

Indeed the semiconductor business launched the Silicon Valley culture and I believe that for Silicon Valley to remain successful, the Silicon Valley semiconductor industry must remain healthy.

Another factor that I think is important in the success of Silicon Valley is the presence of a few large companies. These companies are usually rapidly growing large companies. High technology, high growth big companies are the training for new managers. Now, some people don't really like that, that the people spin off, but in fact it's not really so negative as it may sound.

Most large companies have their plates full. They have more—Mr. Gordon Moore of Intel once said, "We have more technology than we have time or money to bring to market". And in fact most large companies are so busy bringing their present products to market that they leave other opportunities on the table, for new entrepreneurs.

I think it's important, and I'm going to reiterate the fact, that the development of ideas for technology begin in the universities and in the Government-sponsored programs. And this primary research really takes decades of massive investment and it's becoming more and more expensive as our society moves forward in technology.

But, ultimately it does produce new industries and new jobs. It involves big science and it also involves big funding. Applied research, again, is done by large corporations, and that too requires enormous amounts of funding. I might use the example of Apple Computer, whose technology can be traced back to the Stanford Research Institute and Xerox before it was really developed at Apple.

Radical developments take place in small companies rather than large ones. Firms with fewer than a thousand employees are responsible for the major U.S. innovations. A recent article in Forbes magazine pointed out—the article was entitled, 'Where Entrepreneurs Grow"—and they compared the Forbes 500, the major corporations in America, with a list called the Forbes up-and-comer list. The real secret to attracting growth, they said:

> Is to have plenty of members of the Forbes 500 first. A check of companies that made the Forbes up-and-comer class in 1982. . . . the best public companies in return on equities and earnings growth, shows that they can be found in exactly the same places as their larger counterparts.

The spinoff from big companies can be characterized as one product entrepreneurial opportunists. Fewer than a dozen of the 2,500 companies in Silicon Valley are on the Fortune 1,000 list. More than 80 percent of the high technology companies in Silicon Valley employ fewer than 200 people. It is a valley of small businesses.

An MIT study found that innovative companies, especially young technology companies, substantially exceed their larger and more established rivals in rates of growth, taxes paid and jobs created. Incidentally, up until recently—the last 2 years—almost two-thirds of Silicon Valley companies succeeded.

There was a study made, continuing study, by Alfred Bruno, professor of business at the University of Santa Clara, who has tracked some 200 companies in Silicon Valley for the past 20 years.

He found that up until about 1981 one-third of those companies succeeded in their present entity, one-third were merged or acquired, and one-third vanished. He has found in his recent findings that those numbers are degrading quite rapidly.

Another factor that makes Silicon Valley successful is certainly the entrepreneurial example. I think we know of plenty of examples that are held up to that success. In 1957 eight young engineers walked out on William Shockley, the creator of the transistor, to form Fairchild Semiconductor. Shockley is often quoted as labeling these entrepreneurs "The Traitors Eight." And more than any other one single event this created the Silicon Valley culture.

In the following 20 years thousands of so-called traitors left Fairchild to form dozens of companies, and these companies include National Semiconductor, Intel, and Advanced Micro Devices. The examples of startup companies were then followed by others and eventually the geneology decending from the Fairchild family embraced over a hundred companies. And I think you see some of them here on this chart to the left.

Another factor, I think, that is at work is the Silicon Valley network. It is the most sophisticated network outside of Wall Street. The catalyst for the network is the venture capital community which has evolved to become the strategic business planner, management consultant, and corporate watchdog.

In fact, one of the reasons I think many companies do succeed in Silicon Valley is because the network goes to work to help companies survive: They help them find new customers, they help them do refinancing, they help them find new managers if necessary, they help them merge with other companies to be successful.

The infrastructure of Silicon Valley is extremely complex and supportive. It involves legal advice, copyrights and license counseling, marketing counseling, management counseling, banking and various kinds of supports, investment bankers, manufacturing help and subcontractors, and a myriad of other services that support—that are within 50 miles of this valley that almost any company can take advantage of.

It's one of the factors, I think, that makes it very difficult to grow Silicon Valleys in other areas of the country, such as my hometown Pittsburgh, where I've spent some time talking about this subject, where there is no infrastructure as such to really support new and growing companies.

Another factor is the competition that exists. I won't elaborate greatly on that, except to say that in Silicon Valley you don't have to produce a competitive product to be a competitor. Companies compete with one another for employees, they compete with one another for attention because the hot growing companies attract better employees and better multiples.

Finally, the most significant factor, I think, is the return on investments. Currently over $4 billion in venture capital is reportedly available for new ideas. And according to Venture Economics, approximately 30 percent of national venture capital investment activity is in Silicon Valley.

In the past it was not uncommon to expect an annual compound return of 20 to 30 percent, and the more successful ventures can achieve returns in the hundreds of percent. The enormous returns on investment are achieved because Silicon Valley and this venture network creates the most productive product and market development environment found anywhere in the world.

U.S. industries spent $30 billion in development in 1981, yet it took less than $50 million to create Apple, Intel, Tandem, ROLM, Genentech, and you could probably throw about half a dozen more into that.

Return on investment is important, not because it makes people rich. It's important because it motivates new investments and new ideas. And it's important because much of that wealth, quite honestly, is recycled back into the valley.

The question, of course, is: Will it continue? Michael Kommer in his book entitled "People of Paradox: An Inquiry Concerning the Origins of American Civilization," said: "The United States may well be the first large scale society to have built innovation and change into its culture as a constant variable, so that a kind of creative destruction continually alters the face of American life."

We have already witnessed the waning preeminence of many Silicon Valley companies. Some large firms do not keep pace with the technology, some small firms are unable to achieve the necessary product and market leverage. A leveraged position enables companies to attract strategic partners in business, increase their talent base, and attract additional capital.

The return on investment in the venture network will continue to stimulate new technology, I believe, for some time for some companies. But, you may expect that creative destruction will occur also and it will occur more rapidly in Silicon Valley, perhaps, than anywhere else. Some will succeed and some will fail. It's part of the process.

Turning to some of the solutions—it is very difficult to come up with solutions—I should say that the technology industry in its approach to Washington and in its presentation of various solutions is a relative newcomer. The industry as such, and I think much of it has been led by the Semiconductor Industry Association in approaching Washington, has only occurred within the past 5 or 6 or 7 years.

Many of the other interest groups in this country have been talking to Washington practically since its founding—so ideas and how to solve problems, we don't always know. We're a creative industry and much of the companies in this area are focusing on survival, competitive survival and not on tax issues.

However, we must continue to invest in basic research, which is the wellspring of future industries, jobs and technical education. We must encourage and provide incentives for industry to invest in university research. Because of the high cost of research, industries must collaborate on funding, avoiding the wasteful duplication of resources.

An across-the-board tax credit of 25 percent would allow high tech firms to double R&D expenditures from 2 percent to 4 percent of sales. In the semiconductor industry it's now much, much higher, somewhere around 14 to 15 percent. Since the inception of the R&D tax credit, the U.S. semiconductor industry has increased its R&D expenditures by 75 percent, and that has only put it on par with the spending of Japan.

We can also encourage innovation and risk through phased R&D tax credits. In other words, the percentage of tax credit allowed should increase the proportion to pretax revenues actually committed to R&D.

Another recommendation may be to reevaluate the present role and activities of the Federal labs and perhaps shift some of their emphasis from esoteric scientific projects to address the industrial competitiveness issue on the basis of technologies.

Tax depreciation guidelines must be revised. In high technology industries production equipment becomes obsolete within a few years. Tax credits should be devised that reward investment in manufacturing technologies that make us competitive with Japan.

And I would only come back and remind you again that we do not lose our industries in research nor in development we lose our industries in the manufacturing and production cycles of the business. When we lose the markets we lose the return on investments that we have made for 10 or 20 years in that technology.

Finally, real interest rates in this country must be kept low in order to fuel our investments in the future. With regard to technology transfer through licensing and similiar agreements, U.S. negotiators must recognize that there is simply no substitute for genuine market presence in Japan or elsewhere.

I'd like to just maybe conclude with a comment on industries policy, and I'd like to quote Chalmers Johnson, who is a former political science head at Berkeley and an expert on Asian studies. He says:

> The debate over whether industries policy should discriminate between winners and losers, supporting winners only, or converseiy supporting losers only, is also misconceived. As we have already seen, the United States needs both capital-intensive and knowledge-intensive industries as a prerequisite to fulfilling its global role. Support for research and development in high technology therefore does not mean that we intend to replace older industries with newer ones. It does mean that the high tech sector is where the United States could and should command a comparative advantage in international trade.

Thank you.

[The prepared statement of Mr. McKenna follows:]

PREPARED STATEMENT OF REGIS MCKENNA

What Makes Silicon Valley Grow

Silicon Valley and Route 128 in the Boston area have captured the attention of the world. North of Moscow near Zelenograd is an area the Soviets refer to as Silicon Valley. The Japanese have dubbed Kyushu, their southernmost main island, Silicon Island. Various places in Canada, Poland, Brazil and Scotland are called Silicon Valley. There is a Silicon Desert in Arizona and a Silicon Prairie in Texas.

Silicon Valley is a symbol of innovation, growth, entrepreneurship, the prosperous future of high technology and the coming of the age of information.

But to assess Silicon Valley's future, one must appreciate the factors that constrain, as well as spur, its growth. The Valley is a highly focused place. Its accomplishments are vast, but they actually involve one phase of a much larger technological process. To understand what goes on in Silicon Valley, it is equally important to understand what does not go on there.

Virtually all of the Valley's famous companies are "developers." They are the "D" of R & D. Drawing upon basic research (largely funded by the government and conducted by universities) and applied research (largely done by major U.S. corporations), they commercialize technologies and prepare them for production and marketing.

The achievements of Silicon Valley companies such as Apple, Intel, Rolm and Tandem are legendary. But in 1984 one must regard such successes with a note of caution. Unless the Silicon Valley's high-technology "developers" can fund rapid advancements in production and manufacturing engineering (in addition to product development), we may not see the long-term survival of many of the successes of today.

In the feverish world of high technology, short-term success simply does not guarantee long-term success.

From basic research to market may take 10 to 20 years of public and private investment. The return on all that is only achieved when the companies benefiting from that investment "own" the resulting market and produce a return on investment. That return on investment is not only measured by the return to stockholders' equity. There is also a return on social investment in the form of new industries and new jobs.

With that stern proviso out of the way, let's look at some of the factors that have contributed to the growth of Silicon Valley.

Geography has confined the explosion of technology within the Santa Clara Valley, and created a unique social and economic network.

It took 25 years for Silicon Valley to emerge, and many factors contributed to its evolution. Six key ingredients combined to form the Silicon Valley culture:

1. SEMICONDUCTORS AND GEOGRAPHY

These are the two most important factors in influencing Silicon Valley's culture. The name Silicon Valley obviously derives from these two influences.

You can trace almost every significant innovation in Silicon Valley to semiconductors. But you can also trace the origins of the entrepreneurial culture to the semiconductor patriarchs.

According to Dataquest's Lane Mason, the total worldwide semiconductor market in 1983 was 18.7 billion. Companies with headquarters in Silicon Valley generated 18 percent of that figure. However, they generated probably twice that amount with their ideas, innovations, patents, etc. By 1987, the worldwide semiconductor market will be $41.1 billion.

The integrated circuit, the microprocessor and the semiconductor memory were launched here. They are the heart of every electronic game, toy, computer, satellite communications system, microwave oven, cash register, telephone, energy and weapon system. Hundreds of new semiconductor products come forth every year.

In fact, the microprocessor created the personal computer and the small-business computer marketplace. According to Dataquest, total worldwide sales in 1983 for both these industries was $17.5 billion. By 1987, total annual sales will reach over $62.2 billion (Dataquest).

The semiconductor industry is a creative, dynamic industry. With imagination, risk and the entrepreneurial spirit, this technology is readily put to work. And that's what Rolm, Tandem, Convergent, Apple, Amdahl, Altos, TeleVideo, Measurex and hundreds of others are doing (putting semiconductors to use).

Silicon Valley is a relatively small area walled in by natural boundaries. These boundaries create a "global village." In such a village the social, political and economic networks rapidly develop and become interdependent.

The industry and the geography bring together people with similar interests, backgrounds and technology perspectives into a common melting pot--or in the same "village." We live in a caldron of technology and ideas.

Indeed, the semiconductor business launched the Silicon Valley culture. And for Silicon Valley to remain healthy over the long term, the Silicon Valley semiconductor industry also must stay healthy.

2. THE SECOND FACTOR INFLUENCING SILICON VALLEY CULTURE IS THE PRESENCE OF A FEW LARGE COMPANIES--WITH EMPHASIS ON RAPID GROWTH.

High-growth companies are the incubators of ideas and the training grounds for managers. However, it is difficult to create a stable environment or a broad base of equitable incentives when companies grow fast. It is a situation in which new ideas are generated even faster than the company can respond to them.

Not all large companies are part of the Silicon Valley culture. The ones that are identified as part of the culture generally participate in new, rapidly growing markets. Much of the culture as well as many of the early spin-offs came from the semiconductor companies. This is understandable when analyzing the dynamics of the industry.

Between 1968 and 1978, the value of world semiconductor corporations increased fivefold. The period between 1978 and 1980 saw another fivefold increase.

Despite the fact that the semiconductor industry generates a prolific number of new products, only a small portion of the ideas gets developed because of constraints in time, people and money. Ideas that do not "fly" within the company often are the basis for start-ups.

At this point, let's review the development of these ideas. Most are the products of basic research undertaken at university or government institutions. Often the most arcane investigations produce unexpected spin-offs. Many of the old-timers in high-energy physics, for example, insist that the "on/off" counters they developed to detect atomic particles are the precursors of today's digital computer circuitry.

In any case, such primary research requires decades and is a massive investment in society's future. Ultimately, it produces new industries and new jobs. But it involves "big science," and in turn, big funding.

Applied research demands almost-as-big funding in the form of corporate investment. This stage of technology development, therefore, involves big companies. When people leave these large firms to form small start-up "development companies," they generally seek venture capital.

There is a "creative destruction" that occurs between big companies and small companies in Silicon Valley.

Radical developments take place in small companies rather than in large ones. Firms with fewer than 1,000 employees are responsible for one-half the major U.S. innovations between 1953 and 1973.

A recent issue of Forbes printed an item entitled "Where Entrepreneurs Grow." The article states:

"Ask state officials what draws new business and they will tell you about tax incentives, low-interest financing and a dependable labor force. But entrepreneurs know better. The real secret in attracting growth companies is to have plenty of members of the Forbes 500 first.

"A check of the companies that made the Forbes Up Comers Class of 1982,... the best public companies in terms of return on equity and earnings growth, shows they can be found in exactly the same places as their bigger counterparts."[1]

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[1] Stephen Kindel, "Where Entrepreneurs Grow," Forbes, 28 February 1983, p. 52.

The spin-offs from big companies can be characterized as one-product entrepreneurial opportunists. Indeed, Valley entrepreneurs often claim that they took their ideas to former managements before they set out on their own. The fact is, entreprenial-minded people are more likely to be unhappy in large companies.

Fewer than a dozen of the over 2,500 companies in Silicon Valley are on the Fortune 1,000 list. More than 80 percent of the high-technology companies in the Valley employ fewer than 200 people. It is a valley of small businesses.

An M.I.T. study found that innovative companies, especially young-technology companies, substantially exceed their larger, more established rivals in rates of sales growth, taxes paid and jobs created.

This big versus little phenomenon has created a counter response by these fast-growing companies in the form of the "corporate culture" and "social-play-work" environment. Swimming pools, basketball courts, beer busts, corporate incentives, contests and various incentives are experiments to meet the "as we grow big, we're going to treat our people differently" phenomenon. Silicon Valley companies not only innovate with technology, they innovate in management techniques and styles, as well. But few of these programs address the budding entrepreneurs within large company.

A few experiments have been made, but no formula has yet been found to harness the energy, ideas and power of the entrepreneur within the big system.

3. THE THIRD FACTOR INFLUENCING THE SILICON VALLEY CULTURE IS THE ENTREPRENEURIAL EXAMPLE.

In 1957, eight young engineers walked out on William Shockley, the creator of the transistor, to form Fairchild Semiconductor. Shockley is often quoted as labeling these entrepreneurs, "the Traitors Eight." More than any other, this one event is the origin of the Silicon Valley culture.

In the following 20 years, thousands of so-called traitors left Fairchild to form dozens of companies. These companies include National Semiconductor, Intel and AMD. The examples of those upstart companies were then followed by others. Eventually the geneology descending from the Fairchild family embraced almost 100 companies.

In 1975, Bob Swanson was sitting at his desk at Kleiner Perkins, a venture-capital firm in San Francisco. Bob's degree was in chemistry, not in engineering. But the thought struck him, "Why not do something new in chemistry" like his friends were doing in electrical engineering. He searched the literature and not only found great interest in recombinant DNA, he also found Herb Boyer at the University of California, San Francisco. The two formed Genentech.

We who live and work in the Valley all know someone who has ventured. The newspapers, magazines and broadcasts exemplify, analyze and idolize the successful entrepreneurs (and the younger the better).

But when you know one of these people, the mystery vanishes. "Hey, I do that as well as he can." You know Bob, Steve, Al, Jim, Charlie, Dave or Sandy. They worked in the next office, at the next bench, down the hall, went to the same school or sat in meetings with you. They started in garages, bedrooms and the backroom of a candle factory.

Charlie Sporck is the son of a grocery-store owner. Jerry Sanders is one of 12 children from the South Side of Chicago. Bob Noyce is the son of an Iowa minister. And Steve Jobs is a college dropout whose father is a machinist. You can identify with these people--and many do.

4. THE SILICON VALLEY NETWORK IS THE FOURTH INFLUENCING FACTOR.

When Steve Jobs first talked to me seven years ago, I suggested he talk to Don Valentine, a venture capitalist and former director of marketing at National Semiconductor and Fairchild. I worked for him at National. Don was also the first investor in Atari, where Steve Jobs worked as an engineer. Nolan Bushnell also suggested Don Valentine as a source of capital to Steve.

Don sent Steve to Mike Markkula, suggesting that he ask Mike to help him develop his business plan. Mike had worked for Valentine at Fairchild. Mike developed the plan and invested approximately $100,000 for one-third of the company, and became president.

At Intel, where Mike had retired early, he worked with Hank Smith. Hank had left Intel a few years earlier and joined Venrock, the Rockefeller's venture-capital firm. Venrock became an early investor in Apple and one of its partners still occupies a seat on the board.

Markkula went back to his alma mater Intel one day to demonstrate the first personal computer. Art Rock, venture capitalist and Intel board member, saw the presentation and asked to invest. He supplied the early venture capital for Fairchild, Intel and Teledyne, to name just some of his successes.

Art introduced the Apple to Henry Singleton, chairman of Teledyne. Both Art and Henry became investors and board members of Apple.

The illustration can extend to early management acquisitions, banking relationships, legal counsel, early Apple users in the business and the financial community and journalist contacts.

Similar examples can be made for most of the successful Silicon Valley companies.

The network or supporting infrastructure of Silicon Valley is the most sophisticated ou[illegible]l Street.

The catalyst for the network is the venture-capital community, which has evolved to become a strategic business planner, management consultant and corporate watchdog.

The network is put to work for new companies, and many members of the network have been well honed on dozens of start-ups.

Within the network, the entrepreneur will find:

- legal advice ranging from corporate formation and structure, to contracts and licenses, to patent and copyright protection
- marketing counseling and communication services
- management recruiting
- banking and CPA contracts
- early customer contacts for beta sites
- investment bankers
- manufacturing help and subcontracts
- a myriad of other services

All these life-support systems can be found within 50 miles of the Valley.

5. THE COMPETITION FOR SUCCESS WITHIN THE CULTURE IS THE NEXT INFLUENCING FACTOR.

Success in Silicon Valley means not only conquering our competitor but displacing the "king of the hill" (or Valley).

To be bigger and better than Apple, Intel or Tandem is the stated goal of many entrepreneurs in Silicon Valley. Thus, there are many highly visible successful models in Silicon Valley.

A competitor in Silicon Valley is anyone who is recognized as more successful and receives more attention than you or your company.

(I call this the Apple complex. It is usually stated as "How soon do you think you can get me on the cover of Time magazine?")

The key players in entrepreneurial companies exhibit unabashed pride and enthusiasm for their business. They compete not only out of pride but because successful "hot" companies attract better customers, better talent and higher multiples in the public market.

6. RETURN ON INVESTMENT IS THE LAST INFLUENCING FACTOR.

Currently, over $4 billion in venture capital is reportedly available to new ideas. But no one really knows how much risk capital is available because it comes from so many different sources. These sources range from universities, large company pension funds, institutional investors, wealthy families, second mortgages, executives who already have gone through one cash-in cycle, brothers, sisters and not-so-rich uncles.

According to Venture Economics Inc., approximately 30 percent of national venture-capital investment activity is in Silicon Valley companies.

In the past it was not uncommon to expect an annual compound return on investments of 20 percent to 30 percent. And the more successful ventures can achieve returns in the hundreds of percent.

The enormous returns on investment are achieved because Silicon Valley and its venture network create the most productive product and market development environment found anywhere in the world.

U.S. industry spent almost $30 billion on development in 1981. Yet it took less than $50 million to launch Intel, Apple, AMD, Genentech, Rolm, ASK and Tandem. And the time from concept to realization of a product is incredibly short.

It took over 30 years for radar, magnetic recordings, antibiotics and the pacemaker to go from idea to market. It took the zipper 30 years.

It took the microcomputer two years, the personal computer two years, recombinant DNA insulin less than seven years.

Apple and Genentech were both launched on a few hundred dollars about seven years ago. Apple's market value today is over $1.8 billion.

Genentech's market value is $474 million. Each company began on a few hundred dollars and returned hundreds of times the investment to the entrepreneur.

Public offerings such as ASK, Altos Computer and Convergent returned over one hundred times the investment to original investors.

Return on investment is important not because it makes people rich. It is important because it motivates new investments and new ideas. And it is important because much of the wealth is recycled back into Silicon Valley.

The question, of course, is, Will it continue? Michael Kommer, in his book entitled "People of Paradox: An Inquiry Concerning the Origins of American Civilization," said: "The United States may very well be the first large-scale society to have built innovation and change into its culture as a constant variable, so that a kind of 'creative destruction' constantly alters the face of American life."

We have already witnessed the waning preeminence of many Silicon Valley firms. Some large firms did not keep pace with the technology. Some small firms were unable to achieve the necessary product or market leverage. A leveraged market position enables companies to attract strategic partners in business, increase their talent base and attract capital.

The return on investment and the venture network will continue to stimulate new happenings in Silicon Valley for some time, for some companies.

But you can expect that "creative destructions" will occur at a rapid pace in Silicon Valley. Some will succeed, others will fail. It's part of the process.

A Hard Look at the Future

Today everyone knows that "Japan Inc." poses the fiercest competitive threat to our high-technology industries. Unfortunately, the true nature of that threat is poorly understood. Discussions within the media focus on management styles, "quality circles," work ethic and the competitiveness of U.S. products.

These ideas all have their merits, but the real issues have to do with foreign trade policy and domestic capital formation and technology licensing. One would assume that research and development has always played an important role in Japan. It must be noted that Japanese industries have devoted remarkably little money to this area. From 1950 to 1978 Japanese firms entered into approximately 32,000 licensing agreements to acquire foreign technology, mostly from the United States. Japan spent only $9 billion to acquire technology that cost Americans nearly $500 billion to develop.

Instead the Japanese have focused on using low-cost, government-backed capital to refine production techniques and invest heavily in advanced manufacturing equipment. The cost of capital for Japanese semiconductor firms, for example, is approximately four to eight percentage points lower than for U.S. companies. More important, certain favored Japanese companies have intangible government support that leads to large amounts of debt capital. Few American companies would have access to such amounts of money through our commercial banks. Relatively unconstrained by the capital market, Japanese firms can survive on much lower net profits as a percentage of revenues--probably an average of about 3 percent. Even in recessionary times the Japanese can afford to expand their manufacturing capacity and make key investments in the future.

Many Japanese firms have made real advances in competitive manufacturing systems and earned a justifiable reputation for quality. By contrast, U.S. high-technology firms have trailed in their investment in automation and manufacturing technologies. This country has spawned successive generations of advanced products, but it has regarded manufacturing efficiency as a secondary concern.

The current public debate over high-technology policies in the United States focuses on R&D tax credits, education and trade. But the most critical need is for production and manufacturing and market ownership incentives.

By protecting its domestic market from outsiders, Japan has been able to reach efficient, high-volume production for export. The Japanese have honed their manufacturing technologies within a secure market base. This firm policy is strategic. It is targeted at key sectors, such as leading-edge semiconductor devices.

In other words, with comparatively little spent on R&D, the Japanese have taken their plentiful supply of cheap capital and invested it in innovative, high-volume production behind the high walls of their protected market.

The Japanese typically enter foreign markets with low-priced exports. And they do so just at the right moment when their foreign competitors, such as the United States, are ramping up their production. This tactic stops or delays return on investment to U.S. firms. The cumulative effect of this is to deny U.S. companies the return on investment needed to finance the next round of development and manufacturing expansion and refinement.

In the face of this concerted strategy, there are few business choices available to U.S. companies, and all are unpleasant. As small U.S. firms lose the marketshare battle to Japan, their equity market dries up. In many cases American firms have been forced to cede certain product markets in order to concentrate on others that appear less threatened. Many small companies encounter debt limits and have to be bought out by larger ones, which historically has led to decay of innovation.

Solutions

Solutions to maintaining a successful entreprenurial environment and internationally competitive high-technology businesses are not simple, easily implemented or even apparent, as yet.

Many of our national leaders do not even understand nor do they even recognize the potential impact that looms if we lose the technological strength of this country.

The leaders of our country must understand how the closure of the Japanese market to our firms ultimately disrupts capital formation in the United States. We need to bargain, and not with oranges and beef, but with access to strategic high-technology U.S. markets. The Japanese understand this trade game. It is their own.

One significant exception to the closed Japanese market illustrates this point well. For 20 years IBM has had relatively open access to Japan. And for 20 years competing Japanese firms have not been able to use their domestic market as a protected production base. IBM product innovations have kept Japanese computer companies on the defensive. Foreign access has kept that one market segment truly competitive.

According to Chalmers Johnson, former chairman of Political Studies at the University of California, Berkeley: "The debate over whether industrial policy should discriminate between winners and losers, supporting winners only, or conversely supporting losers only, is also misconceived. As we have already seen, the United States needs both capital-intensive and knowledge-intensive industries as a prerequisite to fulfilling its global role. Support for research and development in high technology therefore does not mean that we intend to replace older industries with newer ones. It does mean that the high-tech sector is where the United States could and should command a comparative advantage in international trade.

"Support for industrial R&D is not just a matter of funding. It also includes a needed reorientation of our science and technology apparatus to develop production technology. As is well known, Japan pursues a policy of promoting 'engineering R&D.' Japan's orientation toward R&D is to take basic scientific discoveries made elsewhere and commercialize them, to engineer cost reductions and quality controls into them, and to concentrate on innovative design. Reflecting this orientation, Japan graduates annually more engineers than the United States does--in 1980 almost 87,000, 46 percent of them electrical engineers, versus the U.S.'s 63,000--even though its population is only half that of the U.S.

"By contrast the United States concentrates on 'Nobel Prize R&D,' graduates more chemists and physicists than Japan, and institutionally isolates its basic R&D from industrial and commercial pressures. One must not overstate this dichotomy between Japanese engineering and U.S. pure science

R&D, since Japan is going more and more into basic science and U.S. engineering schools are beginning to receive significant private support. But the distinction does reflect important differences of emphasis between the two countries."

We must continue to invest in basic research, which is the wellspring of future industries, jobs and technical education. We must encourage and provide incentives for industry to invest in university research. Because of the high cost of research, industry must collaborate on the funding, avoiding the wasteful duplication of resources.

An across-the-board R&D tax credit of 25 percent would allow a high-tech U.S. firm to double R&D expenditures from 2 percent to 4 percent of sales (with only .02 percent loss in after-tax profits). Since the inception of the R&D tax credit, the U.S. semiconductor industry has increased its R&D expenditure by 75 percent.

We also can encourage innovation and risk through phased R&D tax credits. In other words, the percentage of tax credit allowed should increase in proportion to the pre-tax revenues actually committed to R&D.

Another recommendation may be to reevaluate the present role and activities of federal labs and perhaps shifting their emphasis from esoteric scientific projects to address the industrial competitive technologies issue.

Tax depreciation guidelines need to be revised. In high-technology industries, production equipment becomes obsolete within a few years. Tax credits should be devised that reward investments in manufacturing techniques that make us competitive with Japan. Such credits should cover the cost of exploring, developing and installing such innovations.

Finally, real interest rates in this country must be kept low in order to fuel our investments in the future. And with regard to technology transfer through licensing and similar agreements, U.S. negotiators must recognize that this is simply no substitute for a genuine market presence in Japan and elsewhere.

There is no such thing as a complete list of solutions to these problems. Those of us in high-technology industries "have seen the future, and it is here," but it is also everywhere and changing too quickly for any single human mind to comprehend. What we need is not so much a litany of solutions, but an open attitude to the future and the dramatic changes it will demand from us all.

Representative Lungren. Thank you very much.

We'll go with questioning of 7 minutes a piece, if it's all right with my colleagues. There are a whole bunch of things we could talk about, all the way from Simpson-Mazolli to basic research, but let me try and confine some of my questions to this, which is: Do we make a mistake in trying to look at Silicon Valley and take some lessons out of it to suggest that we might be able to have other Silicon Valleys in the United States?

There is some suggestion in your analysis of the historical perspective here on the uniqueness of this situation. How much can we read out of the experience of Silicon Valley to guide us in national policies, and how much is too much to read out of Silicon Valley? In other words, what are the essential lessons, Mr. Noyce, that you would suggest that we might take back for application generally; and second, are there things we could do to promote a number of Silicon Valley-type situations around the country, recognizing, obviously, that you can't have a total country that's based on high tech primarily, even though it may utilize the fruits of high technology?

Mr. Noyce. Well, first of all, let me comment that there are other areas that are developing for which we have great hope. You can think of the Research Triangle down in North Carolina. You look at the investment that is being made in Texas around Austin right now and you can certainly believe that within the next several decades that that will develop.

One of my standard responses has been, when people have come to me and asked, "How can we recreate what they're doing in the Research Triangle?" My response has been to "start 25 years ago." Because that has been the gestation period of that effort in trying to bring research universities together and get funding for putting up venture capital and speculative buildings to house these new areas.

The main thing, though, I think is that the time for the maturation of these activities is far longer than one election cycle. That then becomes a difficult question to address at the congressional level. It almost has to be done as an article of faith, as Les has said, in the support of fundamental research and then let the ideas flow as they will and the industry develop as it will.

But I certainly think it can be done in other places.

Representative LUNGREN. Well, I guess my question is: If you look at the Research Triangle, there doesn't appear to be the spin-off properties in that environment that you've seen here in Silicon. Are you saying that's just a matter of time, or is there a lack of the entrepreneur there, the venture capital available in that setting as we have here?

Mr. NOYCE. I think it's just at an earlier stage of the development. You know, I recently thought about this subject when we were talking to a computer museum group up in Boston and realized that 15 years ago nobody paid any attention to this industry at all. And I couldn't understand why until I started putting the numbers down.

The semiconductor industry was, you know, only $100 million. That was unimportant compared to the auto industry. Now the electronics industry is bigger than the auto industry and consequently it is getting the attention. But 15 years ago that was not the case.

And what is happening, of course, is that these new knowledge-based industries now are becoming more than half of the economic activity of the United States. That was not the case 30 or 40 years ago. It was manufacturing of autos that typified what American industry was about 40 years ago. That's not the case today.

Representative LUNGREN. One of the big news stories the past year or so with respect to Silicon Valley, at least as perceived in Washington and other parts of the country, had to do with Atari announcing they were going overseas with a number of their manufacturing jobs. And as Congress often does, many people respond viscerally and automatically and overwhelmingly to that kind of news.

And the comment was, "Well, the Silicon Valley phenomenon was short lived, it doesn't mean much for jobs because here we already have a rapid export of jobs beginning in that industry."

How would you describe—I'd like to have all three of you respond to that, if you will—how would you describe the situation with respect to the export of jobs from Silicon Valley to operations overseas? Is it a significant or insignificant part, or are we just talking about a natural development in terms of where these businesses have been and where they're going? And what does it mean overall in terms of the employment picture to Silicon Valley?

Mr. NOYCE. Let me take a first shot at it, and I'm sure that other people will want to comment. We have as a matter of policy tried to maintain our employment in Silicon Valley at a constant because, as you know, housing here is significantly more expensive than it is anywhere else in the world. We find it increasingly difficult to recruit people to this area because there is so much in the way of employment here already.

Consequently, we have started the Silicon Forest and a few other things like that. In terms of whether we will do activities here or overseas, let me comment that we have set up design centers overseas and we will encourage that. We will continue to do that particularly if we don't have the allocation of R&D across all of our sales.

The way those rules are set up now encourages the research to move out of the United States, and that is something that you really ought to address. Typically, the jobs that have been exported are the low-skilled jobs where the wages that are paid in the United States cannot be justified in terms of the value added by those employees.

And if we are to have a higher standard of living than we have in other parts of the world, I think it is clear that we must work at a higher value kind of occupation than the assemblers in Hong Kong.

Representative **Lungren**. And so training and education is essential in that respect?

Mr. **Noyce**. Definitely.

Representative **Lungren**. Mr. Hogan.

Mr. **Hogan**. I would like to comment on both of your questions. That is, what can you do to establish clones of Silicon Valley around the United States? Is there some lesson you can take from here and take someplace else? I agree with Bob. I think Research Triangle will develop in time, and I think San Antonio will also.

Why are they attractive? They are attractive mainly because the universities are extremely well supported in those two areas. The Governor of North Carolina, Jim Hunt, came out to visit us and he is a man of tremendous foresight and great political courage because he got, like, $25 to $27 million out of his legislature and used it even to support some of the private universities in the State because he said, "Why not? They're damn good universities and they're going to create the knowledge that we need here." And he's right, he's absolutely right.

I think that if you try and plan, though, and say, "All right, we're going to get a lesson and now we're going to take it over here to Oregon or Route 128 and we're going to set it up." It probably won't work, because it is a very complex thing.

As Regis pointed out, there is an infrastructure that exists here, but it took 25 years to develop this infrastructure. And it involves the universities. We are very fortunate to have two of the finest universities in the world right here, Stanford and the University of California at Berkeley. Certainly, I can't judge all other fields, but in our field of endeavor they are two of the finest universities in the world.

That's very, very important to us and it was one of the things that attracted us here in the beginning and it's also a part of the infrastructure that Regis referred to. It's one of the important links in it.

So that I think the thing to do—I think we all three agree on that; I warned you that we would have differences of opinion because of different experiences that we've had—the thing to do is to support research, to make certain that the incentives are there, both for the venture capitalists in the capital gains tax and for the entrepreneur in terms of the risk that he has to take.

He has to leave the comfort of the big corporation and go out with the courage and conviction that he's going to make it on his own. And if there isn't any reward for it, if the reward is about the same as staying with Hewlett-Packard, or now Fairchild or Intel, you know, he won't go, he'll just stay.

So, he has to have that same incentive that Bob had when he walked out of Fairchild and decided that he was going to do it alone at Intel.

With respect to the export of jobs, I think Bob referred to the immigration bill that is trying to make it difficult for us to keep the brains of the other countries within our country. I remember when I was a professor at Harvard back in the 1950's and watch the so-called brain drain from Europe into the United States. I was very proud of the fact that our country had an atmosphere that attracted the very best from Britain and Germany and France. They were coming to our country because the opportunity seemed greater in our country, and it was greater even in those days before Silicon Valley had even begun. These men recognized it.

And now we're trying to close the door to those brains and it's the brains that make it. As Bob said, it's the knowledge industry and he went through a little history of the people who invented the microprocessor chip. I could go through a series of those, of Norwegians, and so on and so forth, and British, and what have you.

If we cannot bring those people over here, then we will go over there and build more and more design centers. We have to have the best brains in the world, and if we cannot bring them here to work with us we definitely will go over and build more design centers in Japan and in Taiwan and in Singapore and in Germany and in France and in England and so on.

So we really are motivated to keep the high technology part of our industries in the United States. And we have done that in the past. As Bob pointed out, the jobs that have been exported by most of us are very low technology, high labor content jobs. And with automation looming now on the horizon in our industry we will find that many of those jobs will come back to the United States.

I won't refer precisely to Atari, but Atari is failing. Obviously, it failed. They sold it for, as I understand it, nothing but a note. And that doesn't smack of being a successful sort of a company to me. Failing companies often try to take drastic measures that don't make sense to most of us in the valley. I say, don't save Atari, let them fail. I don't know what Jack Tramiel will be able to do with it, but God bless him whatever he does. And we'll go our way with or without Atari.

Certainly, it was a rocket that shone brightly in the sky and just like a lot of rockets they burn out pretty quickly, too. But we're trying not to be rockets that burn in the sky and burn out rapidly, and I think you will see that many of the Silicon Valley companies are here to stay.

Hewlett-Packard now has sales in excess of $5 billion, Intel has sales in excess of $1 billion, ROLM has sales that are approaching $1 billion. And, you know, companies that reach that size are companies that are going to stay and prevail.

So, I don't think you should judge the rest of us by something that happened at Atari.

Representative LUNGREN. Thank you.

Congressman MacKay.

Representative **MacKay**. I gather that—by the way, I'm the token Democrat on the panel, and I would like to disabuse everyone of my ideas of industrial policy. I don't believe there is anything realistic to the idea of Government coming in and trying to pick winners and losers and I agree fully with what you say.

I do believe, though, that both Mr. Noyce and Mr. Hogan referred to what has been a very successful industrial policy in this country. And that is strong and consistent support for university research and the creation of and the maintenance of probably the best public university system in the world.

One of the things that bothers me now is, it seems to me, that we are accidentally beginning to change that industrial policy, which I'm assuming we all think has been a success.

Science magazine had an editorial back in March of this year in which they talked about the shift from civilian research and development into military research and development, which has been very pronounced in the last 4 years. My recollection is that there has been a 30-percent reduction in Government funding of civilian R&D and a 66-percent increase in military R&D, and that the civilian sector of research and development is now something like 23 or 24 percent of the total, where it has been traditionally around 50 percent.

Now, as a Democrat I'm also not against defense, I want to make that clear. But it would seem that funding increases in defense research and development out of the money that had been previously spent for civilian R&D is going to have some severe long-term costs, one of those being that the bright researchers are going to tend at the university level to move toward the military research.

I believe one or both of you said, contrary to what we say over at the Cape, which is: "Look at all the civilian spinoffs we've gotten." That's really not as productive as civilian basic research should be.

What if we defined industrial policy in terms of continuing our traditional approach—heavy Government investment in basic research—and we then started looking—and I guess Mr. McKenna said this—looking at the things that Government could do that would actually hasten the process—and I'm using Congressman Ed Zschau's comment—hasten the process of taking the new ideas and making them commercial? It would seem to me that that's a point where other countries are doing a much better job than we are. It would seem to me that we are pouring money into basic research properly and then watching with some frustration as other countries capitalize on our ideas more quickly than we do.

I'm sorry I've rambled with that, but I would like your comments on whether you see it to be a mistake for Government to fund the military research buildup out of or at the expense of civilian R&D and where the consequences of that may show up.

Mr. **Noyce**. Regis, why don't you take the first shot at that?

Mr. **McKenna**. Well, I would only point out that I think that is true of the shift in research and development. In fact, one of the concerns is that while much of the research is being shifted to military today, it's also being shifted out of basic research to more applied research and development of military products.

Representative **MacKay**. Military, by definition, is applied more than basic.

Mr. McKENNA. That's correct.

I think in traditional roles, in much of the defense spending, it was hard to tell whether research was going to be commercial or whether it was going to be military. In fact, in basic research—which is looking for the unknown, and we have to continue funding that—we're not sure whether or not that will go off to benefit the military or the commercial sector.

It probably, and most likely has, in the past benefited both, but the shift toward more applied research and development is certainly, I think, helping to find new ways of perhaps improving the tractors or tanks that sit in parking lots waiting for a war to happen, and is not really helping to create jobs and create new industries.

The other factor that is important is that I'm not sure that the Federal Government can create something that either favors this industry or any other industry, other than to look at what basically makes a strong industrial base in this country, and that is investments in research and development, investments in tax incentives that allow industry to reinvest in its own future.

For example, we might provide more incentives for industry to fund university research, thereby actually creating a closer association between the industries and research that's done and thereby assuring not whether it's military but it's commerical sector, and that industry itself is more closely tied with that basic research.

For example, for the SRC, the Semiconductor Research Cooperative and the NCC that was recently formed down in Texas, the total funding for both of those research efforts is about $150 million. I might point out that the R&D budget of Bell Labs was $2.5 billion and it's approximately the same for IBM.

So those two research institutes, which are essentially attempts by industry themselves to create their own research base, are essentially putting out a drop in the bucket.

I think we have to provide greater tax incentives for industry to invest in university research and basic research itself. We'll be able to tie industry's future to that research if we do that.

Mr. NOYCE. I'd like to comment, too.

First of all, let me say that I agree wholeheartedly with you that we are seeing that shift. I am a regent of the University of California and chairman of the Department of Energy Lab Oversight Committee. We do see, even within those labs, that the total amount of work that is done on weapons is increasing as a percentage of the total.

I would comment too, though, that the large source of funding for public research has really come from DOD. I sometimes think that we do research in this country only out of fear in the public sector.

Representative MACKAY. Yes; we have no constituency other than the fear-based constituency.

Mr. NOYCE. Yes, that is correct.

And it goes back to what Mr. Hogan was saying about having an article of faith that says if we spend money on research, we will be better off in the future than if we don't. But, again, the time constant for that being better off is long compared to an election cycle. And so it's a very tough thing to do.

I do think we need more of the concern on the part of the Congress to build for the future. And that goes into the question of capital formation versus consumption. R&D is another form of investing in the future. It does not have a pay out within a short period of time, and it is very difficult to get the money to do it as a result. But we need that base.

Mr. **Hogan**. I think that part of your questions—and I think there were two of them, really—are of such import that I think all of us should comment on them. The first one as I understand is that there must be something out of this that could be a national industrial policy if only to support R&D in the universities. and certainly we all agree on that; you've heard us comment on it.

I'm certain that anything that comes under DDR&E is classified as military research. There has been a lot of good basic research in the universities that has been supported by DOD. Certainly, the ARPA net, which pioneered packet switching and is a very fundamental development in telecommunications between computers that permit computers to call up each other all around the country and even by satellite into other countries, which is a complex communications task. That was developed in DOD.

One of the initiative that we find around here that we in industry have supported is Stanford's very expensive venture into what they have called their Center for Integrated Systems. CIS. If one will look at the support which we in industry brought to the party—and it's a lot for us to pour into a single university—was $20 million.

But, they had much more than that from Government agencies and if one looks at where they're getting their money, the two big ones might be a surprise—DOD and the National Institutes of Health, of all things. And somehow the National Institutes has somehow justified the fact that they can put a lot of money into supporting electronic research at Stanford University.

Well, I think I could justify it. The lesson I learned at Bell Labs by just watching Mervin Kelley operate and how he justified basic research and the payoff that we're getting built our careers on some of the research that Mervin Kelley was willing to support back in the days when he couldn't justify it to anyone.

So I want to point out that there are a lot of things that Congress can do. Congress can suport more R&D in universities. It is a long-term thing, it's hard to justify. But our grandfathers did have the land-grant college system. And, you know, there was no payoff in their time for that. It must have taken 50 years before anyone could look back at that land-grant college scheme and say: "Boy, that was a brilliant, wise move on the part of our Congress to take such a bold step."

If we're asking for these kinds of things that have the long payoff, then the question of what can you do to hasten the step from R&D to product is a tough one. I don't think you can do anything.

Again, that takes the infrastructure that sort of developed in our industry here. We haven't lost these businesses because Japan innovates better than we do; let me point that out. It's not true. We made the first electronic watches, we made the first electronic calculators over here based on the semiconductor chip.

What they did better than we did was the manufacturing of these at very low cost, making them much more attractive to the consumer. They somehow had a better marketing organization than we did that understood what it was the consumer wanted.

While the HP-35 hand-held calculator will reside in the computer museums of the world as the single most important breakthrough in the field of pocket calculators—you have to have an awful big pocket to put that thing in, it was big and bulky; to me it's a briefcase calculator—but it was the original step. It was the one that I'm saving—I have two of them and I don't use them any more, but I've got them up on the closet shelf—to show to my grandson as the most significant step. And I have sitting beside it on the shelf a Freedan calculator, which it replaced.

We innovated; we made the chip; we came up with the ideas, and Hewlett-Packard came up with the algorithms and put the whole system together as the major breakthrough. But then the Japanese did a far better job of getting the cost down and making that calculator credit-card size.

And, you know, that is something that I don't think anyone can do, but industry. Industry has got to learn that lesson and do the job better. And there was no reason why we lost that watch business and the calculator business except that we were stupid.

Mr. NOYCE. I wonder if I could make one other comment on this last point.

Representative LUNGREN. On the last comment?

Mr. NOYCE. Yes.

If Japan invests in technology the same number of people per capita that we do and invests the same amount of money as a percentage of their GNP in this new industry as we do then after they have done that they have the same amount of money yet to invest, as they do, and the same number of people yet to invest as they did just to match us.

In other words, they're investing twice as much and they have twice as many people trained in these technical areas. Now, where do they invest them? It's on the farther downside of that industrial chain from idea to product.

And I think it's very clear why they have done a better job in those areas than we have: they have more people and more money.

Representative MACKAY. Well, I've exceeded my time. If we have time then I'd like to come back to this point because I believe one of the things that Silicon Valley is showing is that you can do better without the traditional employer/employee adversary relationships.

And I believe one of the reasons that we're not moving products to market fast enough is that we haven't addressed the fact that we don't need the traditional Government/private sector adversary relationship. Our competition doesn't have that, and I think they're whipping our pants off. And I think the stupidity may be broader based than you referred to.

Mr. HOGAN. Well, maybe it is.

And, as Bob pointed out, they've invested a lot of money in the downstream side.

Representative LUNGREN. Congressman Zschau.

Representative ZSCHAU. Thank you, Congressman Lungren.

Les Hogan gave a wonderful testimonial to the Noyce plan for R&D stimulation tax credits. And since this is a debate that's going on in the Congress right now—last month there were hearings held on whether or not we should even continue the R&D tax credits—I would be interested, Bob, in your thoughts on this subject.

Mr. NOYCE. You know, I've had a lot of different thoughts on that at various points in time. One of the things that I think is clear is that our support of basic research has been largely dictated by the fear that I was talking about earlier.

I'd like to speculate on having the research supported by the users of that research. Many industries have done that; they assess the users of the output of their central research labs to sort of direct it. How could that be accomplished?

Well, I would love to see the Federal Government back out of some of the research that is being sponsored at the universities and have the industry step in to fulfill that role. Now, that research does not have direct benefit to any one industry, it is creating a public good. So it really should be paid for by the public. Otherwise, the winning strategy for industry is not to support it; let your competition support it and you get the benefit, they get the cost.

How can that be done? Well, tax credits, obviously, are the way that that can be done so that it is essentially a zero cost to the sponsoring organization. But, still the administration of it, the direction of the moneys, the determination of what should be worked on: What are the most fruitful fields to work in?

I'm not at all sure that the Federal Government is the proper place to determine that, either.

Representative ZSCHAU. To be specific, are you suggesting that for private sector contributions to university research there be a 100-percent tax credit?

Mr. NOYCE. Well, that would be a little too much. But 50—or, whatever the tax rate is. Right now your university credit is incremental, right? It is not zero based.

If we would fix the base where it is now so that the benefit does not disappear as you do increase your contributions to the university I think that—we almost had that in the original law but it disappeared because the universities weren't interested. They were more interested, frankly, in getting their money from the Federal Government—the devil you know is easier than the devil you don't know—and they were concerned about what the prospects would be if it were industry sponsored.

I think a condition of that should be that it's open research and it's published. And there have been some of these grants for the universities which have gotten into this argument as to whether or not the university has the right to publish the results. We have seen quite a bit of the argument there.

Representative ZSCHAU. During the hearings that took place before a subcommittee of the Ways and Means Committee in the House last month some experts came forward and said that the R&D tax credit, the incremental 25-percent tax credit that went into place in 1981 and is gong to expire at the end of next year, that this really hasn't had much of an effect on R&D in this country.

And No. 2, that it might even have a negative effect, using the argument that, because it is incremental, if you do too much R&D this year then the following year it's going to be harder to get above that threshold level. And so companies would tend maybe to hold off on R&D rather than doing more R&D.

I was wondering if the panel might comment on the effectiveness of the incremental 25 percent tax credit on research and development, and whether or not you think it should be made permanent, or extended, or eliminated.

Mr. NOYCE. I'll take a first shot.

The industry, all of the high-tech industry, has certainly supported very vigorously the extension of that R&D tex credit. One of the things that I might point out is that this committee itself indicated that in 1981 the average effective tax rate for the U.S. electronics industry was 50 percent higher than that of industry generally in the United States.

This goes back to one of Regis' comments, that this industry has talked to Washington only relatively recently. All of the other industries have their special provisions, but this industry does not. We would favor a flat tax, we'd love it. We'd come out way ahead because we are one of the underprivileged industries, if you will.

But the idea of having an R&D tax credit tends to equalize that a bit and is a way of setting this industry apart from the other. What we need is to create more of this public good that will promote the interests of this industry. What we need is money to invest, and this is one way to get it.

Mr. HOGAN. I think, Ed, if one looks at the support that high-technology industry has provided to the universities just since that R&D tax credit came up—I mentioned the CIS Program at Stanford. I probably know a little bit more about the details about Berkeley's CAC/CAM Program because I was chairman of the Finance Committee.

We set up a goal to raise $8.5 million in 2 years and in 9 months we raised $18.5 million, all from high-technology corporations in the United States. And I am certain our R&D tax credit had an effect on that. It wouldn't have been quite so easy if it had not been there.

Mr. MCKENNA. I made a statement that the semiconductor companies have increased their spending by 75 percent, but it only put them on par with the Japanese spending. Because we know how the access of capital that they have—not just in easy access, but in the amounts of capital that they have. This is an R&D intensive industry, ranging from semiconductors to computers.

And so I think that the incentive is vital to the survival of the industry, it's not just a nice thing to do. I think that it should be permanent and long term.

I'd like to also point out that I think, while we talk about education and the importance of R&D it was the—and I think largely—the semiconductor industry that drove the technical education community in this country. If you go back to the early 1960's in Stanford and Berkeley they weren't leaders in digital electronics, and in fact they adopted those programs because the industry was here.

So I think this industry is driving, and has driven historically, the basic education in this country as well. It's an R&D intensive industry and I think for the long-term survival of not only the jobs in the industry itself that it represents, it's important that we invest, and invest heavily, in R&D.

Representative Zschau. Congressman Lungren, I have many other questions, but since I have the privelege of representing these three panelists in my congressional district, we have an opportunity to talk all the time; I yield back.

Representative Lungren. Thank you, Ed.

Do you have one last question?

Representative MacKay. Yes.

Representative Lungren. I hope it's a short one because we're keeping the other panel waiting.

Representative MacKay. We basically covered that. I was just interested in the things that government is doing that are essentially the product of the traditional adversary relationship: Slowing down the licensing procedure, slowing down the ability to take products commercial, and probably providing some incentives for companies who can move capital anywhere in the world to just go someplace where they're not hassled.

And I wondered if part of our industrial policy might not be almost like a policy of going back through and stop doing the things that are counterproductive. It seems to me that's a lesson of Silicon Valley. You all have found that by working to prevent an adversary labor-management relationship—which, I guess, is the next panel—that you are able to increase efficiency tremendously.

I mean, there have probably been some things that are lost—I can't think what they are—but there is probably some comfort in being able to fight somebody every day when you go to work. [Laughter.]

And we would lose some things if we tried to do away with the adversary government/private sector relationship. But I wonder if we would lose as much as we gained. That's the thought.

Mr. Noyce. I mentioned one of them in my notes here, and that was the licensing procedure where we lose orders because it takes us longer to go through that procedure than it takes our competitors to go through it.

Representative Lungren. Well, I want to thank the panelists. I have stacks of questions that I could be asking you, but I know your time is very important to you and you have given us a lot of it today. I want to thank you and assure you that Congress is looking at this industry and trying not only to look at what we can do to make sure we get out of your way but what lessons we can learn that we might apply to public policy generally.

So, thank you very much for your time.

Mr. Hogan. Thank you.

OPENING STATEMENT OF REPRESENTATIVE LUNGREN, PRESIDING (PANEL 2)

Representative Lungren. I believe we have the other panelists here. And so at this time we'd ask Mr. Charles Sporck, Mr. Sanders from Advanced Micro Devices, and Mr. Walter Loewenstern to come forward as part of our second panel.

One of the major focuses of our committee hearings is on what I would like to refer to as the people factor: Those policies that reward risk taking, innovation, and entrepreneurship. Two years ago a congressional committee report acknowledged that the human factor in productivity improvement is "underestimated" and is "the least understood facet of innovation."

However, I have found that such committee findings are rare in the Congress. All too often the people factor as it relates to economic growth is ignored in the committee and meeting rooms in Washington. The economic policy discussion instead is often focused on theories on how the economy performs rather than on what motivates individuals and how to encourage their ingenuity and their imagination in the spirit of entrepreneurship.

There is little doubt that our country has the resources and the ability to maintain our technological leadership. To preseve our competitive edge, however, we'll have to focus on policies which bring out the best in the individual or the entrepreneur.

Many companies, particularly in this area, are known for their efforts in making their products what is known as user friendly. Similarly, to neglect the people factor in policymaking would be, I believe, a tragic oversight.

If there is any area of entrepreneurship and the process of innovation where the people factor is most evident, it's in management-employee relations. And today we would like to find out why so many Silicon Valley companies have developed reputations as some of the best companies to work for in the world. Obviously, a large part of the answer is rooted in the willingness of companies to experiment with creative management techniques and to establish work environments which encourage creativity and innovation.

But the committee would like to delve further to discover what has worked and what hasn't. Specifically, if people factors influencing innovation could be categorized into rewards and barriers, what major rewards and barriers would be identified? To what degree has the traditional management-employee hierarchical structure, or even antagonistic relationship, been intentionally disregarded?

How have companies which have increased in size over the years been able to maintain an entrepreneurial spirit? How do employees share in the gains made by a company? What should the proper role be for government at all levels to help foster an environment for entrepreneurship and innovation.

The committee is interested in seeking the answer to these and related issues in today's hearing, and we are honored to have on our next panel representation from three major companies which have become recognized for their deliberate emphasis on positive and effective management-employee relations.

Welcome, gentlemen, to this panel. Your prepared statements will be considered a part of the record, so you may proceed as you wish. I would just say that if we could try and confine our remarks to around 10 minutes then that should give us adequate time for a question-and-answer period.

And I hope that at this time we could begin with Mr Sporck.

PANEL 2. MANAGEMENT-EMPLOYEE RELATIONS: LOYALTY, MOTIVATION, AND REWARD

STATEMENT OF CHARLES E. SPORCK, PRESIDENT AND CHIEF EXECUTIVE OFFICER, NATIONAL SEMICONDUCTOR CORP., SANTA CLARA, CA

Mr. SPORCK. Good morning.

I appreciate the opportunity to testify on the management/employee relations style of our industry, especially compared to the industries of the more traditional variety. I've submitted a prepared statement, and this morning I would like to just summarize my testimony making one point.

And that is—and it can be encompassed in one simple statement—that the management in our industry recognizes the overwhelming importance of people to the success of our companies.

Now, obviously that sounds like a motherhood statement, but we really mean it. And the reason it's significant is that the semiconductor industry and many of the other high-technology industries are different in nature than the more traditional industries.

I came to Silicon Valley in 1959 from a more traditional company back in the Northeast to what was at that time the only successful semiconductor company in Silicon Valley. I noticed immediately that there was a preoccupation of focus on people-related problems in that company.

There happens to be a very good reason for this, and I can give you a couple of examples, one on the traditional side. An automotive company, by and large, when they build an automobile they take four wheels and a chassis and an engine and seats and a body and what-have-you and they throw it together and always a car comes out. Always an automobile comes out. We can quibble about whether it's the right quality and what-have-you, but the car always comes off the line.

In our business we throw in various materials, and a wafer and what-have-you, and sometimes a product comes out. The reason why it's sometimes and the variety there is entirely related to the skill, motivation, quality of the people involved in building it. It's 100 percent. You either succeed or fail, based upon the skills of those people. You don't have moderations in quality, you have success or failure.

Another example is in the area of device development, device design. One can spend 1 to 2 years in this kind of development cycle, such as at National, and have Jerry here beat you to market with a product that maybe may not be a heck of a lot better. But because he beat you to market you have failure, you don't sell at all. Or he brings a product that is somewhat better to market and defeats you so that you get no sales at all.

The significant point there is the quality of the people involved in that design determines wheter you live or not, whether you succeed or not; as oposed to determining whether it's a slight variation in your performance.

These factors force us to have a stark realization of the dependence we have upon people. It drives us to spend a major amount of our management time focusing on how we can effectively get, keep, motivate, et cetera, people. That realization has been intensified over the years here through the growing increase in competition for people.

There is an intense demand for talent and that competition forces us to be properly oriented toward recognizing the needs of our people and focusing on how to go about managing our company so that we address those needs.

And that's basically the point that I want to make. Everything else follows from that one recognition that people are the whole ball game in our business. I happen to believe that our industry is very good at that, especially here in Silicon Valley.

However, as good as we are, there are some other structural factors influencing our business that will determine whether we succeed against the Japanese in the long term. They are not human relations kinds of issues, but other issues which, regardless of how good we are in human relations, will determine whether we succeed or fail.

And I wanted to make that last statement: You've got to recognize it's not exactly a human relations-related item but is a fact of life that we all have to deal with. Thank you.

[The prepared statement of Mr. Sporck follows:]

PREPARED STATEMENT OF CHARLES E. SPORCK

Good morning. I am Charlie Sporck, president of National Semiconductor Corporation. I am pleased to be here at these hearings of the Joint Economic Committee to represent not only National Semiconductor, but also both the geographic region and the state of mind called "Silicon Valley".

We often hear about visitors to this area who come looking for Silicon Valley, and who leave a bit mystified, if not actually disappointed. They may hope to find a place, or a monument, or a secret that tangibly symbolizes the phenomenal ferment of intellect, opportunity and capital which has rapidly and radically transformed technology in the past two decades.

Yet, there is no such monument, and as you will no doubt hear during these hearings, the reason for the deep and wide levels of innovation in this region is manifold. The convergence of talent and resources, and even the climate here, is a remarkable, complex tale that continues to be replayed, as one start-up company matures and spins off a family of other new enterprises.

The Human Factor

You are on target during this investigation, however, in looking at the human factor in the success of Silicon Valley. Innovation is not mined from the ground; rather, it is unearthed from the minds of people who have been placed in an environment where risk and challenge are recognized and rewarded.

I am proud of the fact that National Semiconductor is called upon as an example of that environment which has worked in Silicon Valley, and that you recognize that this company represents a way of doing business and managing its human resources that can be instructive for the nation.

We have been successful. When I joined National Semiconductor as president in 1967, we had sales of $7 million a year. We made a few simple electronic devices then, had fewer than 500 employees, and worked out of a couple of leased buildings as everyone took turns taking orders and shipping product.

This past year, seventeen years later, our sales were $1.6 billion. That is a compounded growth rate approaching 40 percent a year since 1967. We now have more than 40,000 employees around the world, and right here in Silicon Valley we have some 11,000 people. We produce more than 5,000 different products, many of which have been genuine technological breakthroughs for the industry.

Much of this growth has been fueled by a multiple revolution in theoretical solid-state physics, processing technology, and creative applications for our products. But that does not account for all of it, for there are many other semiconductor manufacturers that have not matched us.

The Foundation: Trust

So, how have we done this? Do we have a secret formula? Is it unique to National Semiconductor or to Silicon Valley?

I don't believe it is unique, and certainly what has worked here is reproducible by others. If I were to isolate the human factor for this analysis, and boil it down to one essential element, it would be the necessity to establish trust with employees. On that foundation of trust the rest of the structure of this business can be built.

Easy to say, but not always so easy to accomplish. For what trust itself means is that there is a common understanding and agreement of what is the mission of the enterprise. That is achieved through continual communication with all who work here, with a significant level of participation from employees in the definition and execution of that mission, and with employees sharing the results of the success of that mission.

I stress that it is a continuing effort, to stay in touch with employees, and as importantly, let them stay in touch with you as management. Trust cannot be taken for granted, and it must be renewed as conditions change. But the consequences of this effort are the results we are after: innovation, quality, productivity, and yes, loyalty.

Communication

Let me talk about communication and participation, two essential ingredients in the establishment of trust.

Communication is not just top-down directives on what we do next. Rather, the direction of talk must also go side-to-side and bottom-up as well. It means that barriers to communication must be reduced as much as possible.

An example is our open offices. We all have shoulder-high, movable partitions, and we don't have doors. Admittedly, this arrangement provides the flexibility needed to respond to the rate of change in this industry.

But there is real functional and symbolic value to the absence of walls and doors -- it is easier to talk to your neighbor, or to your boss. The threshold to cross for communication is very low. Ideas, or complaints, don't have to wait long to get aired. Office space, like the absence of reserved parking, also is a symbol of an environment that is meant for business. We focus on the essentials for doing the job, not on the trappings or the pecking orders that are non-essential.

Or another example: any employee can send me or any other executive a direct confidential message on any subject, whether a suggestion or a complaint, at any time. Throughout our buildings we have placed our "answer line" forms, and they are easy to pick up and send in. These confidential messages get answered promptly, and they let me get an unfiltered feel for concerns in the workplace.

We also make multiple efforts to inform employees on the state of the business. These channels range from formal quarterly communications meetings in work units, to video news programs that are distributed all around the world, to a range of publications. Recently we set up a live, closed-circuit television network here in our local buildings so I could talk directly to our people about key issues for the company and answer their immediate questions on the air. When serious issues that affect National are in the news, we also send letters to each employee's home so that he or she can have the full story, right away. I regularly talk to employees on the state of the business in large assemblies held in the "campus" area of our complex, but I also meet with small groups informally at breakfast or dinner.

What we get from this communication is an informed workforce that has an appreciation of what National Semiconductor is doing and how each fits in, and a management that is sensitive and responsive to the concerns of employees.

Participative Management

Participation is the flip-side to communication. When we talk about trust, we really are talking about building a team. A team is most effective when its members have a stake in the outcome, and have been involved in defining how to get there. Managers still have the responsibility and obligation to make decisions, but the decisions are better when those closest to the work have a say in them and have signed up to carry them out.

As an example, National instituted a program we call QUEST several years ago. QUEST stands for Quality Enhancement Strategy, and as much as anything, it is a philosophy of management. The goal of QUEST is on the bottom line -- productivity and quality improvement, which translates into innovation and profit. The mechanics of QUEST, however, include employee involvement with techniques that somewhat resemble quality circles.

We consider the employees' doing the work to be the experts at improving productivity. With the QUEST program we harness that expertise and train managers and employees how to identify, measure, and solve problems using worker participation. Over the last few years we have moved these techniques into a wide range of areas, from production lines to design groups.

One of the direct, and spectacular, benefits of this approach can be seen in our performance as a company in the area of quality. Since 1978, our electrical defect rate for integrated circuits has dropped from more than 8,000 parts per million -- a figure, by the way, that at the time was considered acceptable by everyone in the industry -- to a little more than 100 parts per million now. We believe we are second to none in terms of quality, thanks to our people, but our target now is zero defects.

That is the kind of example that truly demonstrates the payback from listening to your employees.

Training

I mentioned training for participative management, but we also train our people wherever and whenever the skills are needed. In many cases we work closely with community colleges, adult vocational and technical education programs, and on-site television courses from Stanford and other universities to enhance our employees' ability to do the job and stay ahead of it. If the resources outside the company are not available, then we train employees ourselves, developing our own programs in our full-scale training center. We have multiple classrooms, not only in this center, but also in other parts of the plant to keep the opportunity for training accessible. We also encourage employees to pursue their own education through a tuition reimbursement program. Last year National Semiconductor paid $400,000 in tuition reimbursement alone. The total amount invested in internal training of employees here in Silicon Valley was more than $3,000,000.

Just as the need to invest in research, plant and equipment is a vast and growing requirement in the semiconductor industry, a similar need exists for investing in our most important resource, our people. Without both, we as a company would lose our competitive advantages.

For that reason, we at National, as well as the semiconductor industry, support legislation which allows this industry to maintain a competitive edge internationally. This includes not only changes in the law to give fair recognition to the intense level of investment in capital, research and development in this business, but also in education and training for our current and potential workforce.

Compensation

Communication, participation, and training are among the key elements of managing human resources here, but we cannot neglect talking about compensation.

Silicon Valley is a very competitive place, and one of the features that have marked it is the willingness of people to leave for better offers down the street at another firm, or even to start their own business. This affects all employers in the valley.

One of the measures of employee satisfaction is the turnover rate. Certainly as a region, turnover in Silicon Valley is much higher than what you might find in other industrial areas. This is the result of the wealth of opportunity here, and perhaps also reflects a degree of impatience in talented people who make their mark rapidly by changing jobs or starting their own companies.

However, at National, a recent industry survey indicated that our turnover rate was about half that of semiconductor firms in this area. This tells me that we are doing a good job of providing the recognition and reward to our people that they deserve and want.

Another kind of measure is the number of long-term employees we have. You must remember that compared to other major industries, semiconductor manufacturing is relatively young. National itself is but a teenager. Yet, we have enough ten- and fifteen-year employees that we could not fit them all into one local banquet facility to honor them last fall.

This tells me that National is competitive in terms of the salaries and wages we pay. We believe that all employees should have equity in the company, and we accomplish this in several ways, ranging from a stock purchase and profit-sharing retirement plans for everyone, to significant stock options for key positions. We do pay good wages for good people, but the turnover and tenure also tells me that we offer a working environment and challenging jobs that also are enticements that help keep us away from bidding wars with our competitors.

Compensation also takes other forms. National provides competitive benefits, such as a choice of health plans and insurance. Just this year we began a stock bonus plan for workers, sometimes known as a "paysop", under which each employee gets shares in the company automatically every year. Unlike many other firms, however, the paysop at National distributes shares to employees equally, rather than basing it on salary. The result is that a worker getting $20,000 a year will get the same shares as one getting $200,000. A greater proportion of the benefits therefore accrues to employees on the lower end of the salary scale.

This is part of our effort to balance the need to attract and keep employees at all levels and to include everyone as a shareholder in the company. We also added a tax-deferred savings plan for employees this year after it was made possible by recent Federal legislation. This is the 401 (k) program, and National contributes to the savings of employees who chose to participate.

Staying Entrepreneurial

And yet another form of compensation, if you will, is the working environment itself, and the attitude we take toward employees. An important example is the amount of room National provides for creative and energetic individuals to tackle significant challenges.

A good way to look at National is as a cluster of related businesses, which are run by entrepreneurs with a great deal of freedom and a great deal of accountability. The corporation is an umbrella which provides resources and centralized support, but is decentralized in a way that allows us to be very responsive to market conditions. This is an important feature of our solution of how to keep an entrepreneurial spirit alive in a corporation that has grown very large, very rapidly.

The trick is to allow ideas to flourish, to let them take root and grow without smothering them. We do not have a bureaucracy, but instead a loose structure where responsibility is encouraged, and the people can see the results of their ideas and work, and get rewarded for them.

Also part of our working environment is the support we give to employees who may need assistance to handle personal affairs which affect job performance. We have trained counselors on staff, and they work with employees' problems to find solutions that can keep them productive, both on the job and off. Assistance also takes the form of workshops and seminars on topics ranging from stress management to financial counselling, and includes career planning and childcare referral services.

Recreational Park for Employees

A final example of National's interest in its employees is one of which I personally am very proud. This is the current construction of an employees recreational park adjacent to our manufacturing facilities here in Santa Clara. This park represents a deep commitment by National Semiconductor to the people who work here.

On fourteen acres of prime Silicon Valley industrial land, we have just completed the first phase of a full-scale park with playing fields, picnic areas, an amphitheatre, exercise equipment, and eventually shower and lockerrooms and indoor racquetball facilities.

Although the construction of the park is a remarkable new development, it is not a new idea for us. Our main buildings in Santa Clara feature a park-like setting which was included when the complex was first laid out. As we have grown, however, the central campus area is no longer enough for the number of employees at National. Although more and more firms may have some form of recreational facilities on their premises, I don't think you will find many that have dedicated the resources that we have at National Semiconductor.

I would like to conclude this discussion by saying that although there is no one secret to Silicon Valley, we have found several approaches to managing our human resources that are the keys to the success of National Semiconductor.

I will go back to the beginning, and repeat that establishing and maintaining a basic level of trust is the foundation. Trust has to earned and re-earned, and we do it by listening to our people, by responding to their ideas and concerns, and by providing them with the support, resources and freedom to be creative and productive.

Just as the technolgical marvel of an integrated circuit is the result of hard work and ingenuity, not magic, so is the phenomenon of Silicon Valley. I hope these hearings will provide you and the Congress with insights that will prove useful as you tackle the problems and policies to keep America productive and competitive.

Representative LUNGREN. Thank you very much.

Next we'd be privileged to hear from Mr. Jerry Sanders.

STATEMENT OF W.J. SANDERS, CHAIRMAN AND CHIEF EXECUTIVE OFFICER, ADVANCED MICRO DEVICES, SUNNYVALE, CA

Mr. SANDERS. Good morning.

I'm Jerry Sanders, the founding and continuing chief executive officer of Advanced Micro Devices. At AMD we believe that many of our sister high tech companies are not only on the leading edge of technology, but also on employee relations, and that combination has led to phenomenal results.

As an example, on May 1 AMD marked its 15th anniversary. During the current fiscal year, which ends in March, we expect sales of semiconductor integrated circuits to exceed $1 billion. During the most recent 5-year period our compound annual growth rate has been nearly 31 percent, and that includes 2 years of steep recession.

Today AMD is the fifth-largest integrated circuit producer in the United States and the ninth in the world. We're the fastest growing of all major U.S. semiconductor producers. In our most recent fiscal year, sales increased 63 percent over the prior year and in 1984 year-to-date sales are up 100 percent.

In terms of productivity, AMD and the semiconductor industry as a whole are far ahead of industry generally. For the most recent 5-year period, 1978 through 1983, total sales per man-hour increased an average of only six-tenths (0.6) percent in the U.S. nonfarm sector. The median for the semiconductor industry, on the other hand, grew an average of over 11 percent.

What's the secret of our success? In a word, it's people, a dedicated, loyal work force. I believe that if the company takes care of its people, its people will take care of the company. If you want loyalty from your employees you must demonstrate loyalty to them and you must do it first.

I've said for years: People first, products and profits will follow. Good employee relations are fundamental to continuing business success. I'd like to make a few comments on what we do in our industry.

One of the reasons AMD has good employee relations, of course, is because of the fact we're an expanding enterprise. For the economists on the panel, just read Schumpeter; he says it all.

Fundamental to the equation is the promise of an environment that would improve its workers' economic condition. Workers fundamentally work to improve their economic condition. And it's obviously more difficult for someone to improve his economic condition if the enterprise isn't improving its economic condition, that is, we target growth.

So to me the centerpiece, the foremost principle, of employee relations is aligning the goals of the employees with the growth goals of the company. and I think the centerpiece of any employee relations program is enabling workers to identify with the success of the company and participate in its financial rewards.

In my view, it's impossible to do that without giving employees a piece of the action. This means at an absolute minimum: profit sharing. That ties the improvement of employees' economic conditions to improvements of the corporate economic condition in such a way that they understand that when good times come they participate.

In Silicon Valley if somebody wants to change jobs, all they have to do is turn into a different parking lot off a different freeway exit. So you have to offer something special. At my company one of the things that we offer is job security.

We were the first company in this industry to make a no-layoff policy endemic to our programs. If an employee meets and continues to meet AMD's standards his or her job is secured. This allows us to introduce automation, new ideas, and change, freeing the employee, from unnecessary anxiety about their livelihood being threatened.

Employees must feel an identity with their company and with their company's goals. If they do, then they will participate and have pride in the company's achievements.

People want to work for organizations they can feel good about. Employees spend most of their working hours at the workplace. They want to be proud of it, and AMD has extremely high standards. To achieve those standards the people must have pride in what they do.

Most workers really want to do their work well, with pride, and they will respect a company's belief in quality and they will involve themselves in it. An employee wants to believe that the company he or she works for has the right stuff, that is, a good value system.

This means knowing that the company cares about its workers and about the community where they live. Your employees have to trust you. Good relationship between leadership and the lead is trust. One of the ways that you get that is through open communications in facing tough issues.

Sometimes we have to communicate about things which are unpleasant. For example, in June a water quality issue gained a lot of press in this area. The issue involved was previous chemical leakage from underground storage. I directed our chief operating officer in my absence to communicate to all managers the details of the problem and the measures the company had taken to correct it. We let our employees know that we are responsible corporate citizens.

We told employees that we took the initiative. The company discovered the leaks and reported them to the Government. We then took steps to prevent further leakage and contain any existing contamination. We wanted our employees to know what the situation was and what their company had done about it independent of the cost to the company. We wanted them to know that their company cares about the environment of the communities where we live and where they live.

For example, in our facilities in Texas we now use in our manufacturing processes water which, when it comes out of our process, is as pure as when it goes in. Neutralization and filtration result in less particulate matter and a more neutral acidity level than the water when it enters the plant as potable drinking water.

This is necessary in our manufacturing process—pure water—and so we are now recycling the water that we use.

We show our commitment to employees in many other ways as well. For example, the employee assistance program provides an employee and his family members with free counseling services on any type of personal problems on a strictly confidential basis. We also now have a feeling good program, which is preventive medicine, rather than merely participating in excellent medical, dental, life and disability insurance, which you need, of course, to remain competitive.

But, as I said earlier—and I cannot underscore it often enough—it is financial incentives that do the most toward aligning employee objectives with those of the company. To that end we have a stock purchase program that allows employees to purchase stock at a discount. The profit-sharing program I mentioned earlier features cash distributions as well as credit to each employee's deferred compensation account.

And we do occasionally give extraordinary bonuses. This year we're adding an additional incentive of 2 week's pay if we achieve our sales objectives. Incidentally, the profit-sharing payout for the first half of the year was the equivalent of 3 week's pay.

So if you add these all up you can see it becomes a sizable incentive for employees to identify with the success of the corporation.

So, improving employees' economic condition and security are key, and progressive employee relations programs must revolve around these principles. The rest is frosting; the cake is improving the economic condition of the employee and you must pay on performance and results, not effort. Payment on effort is wasted money. Results count.

Therefore, underlying everything we do is the belief that if we act responsibly toward our employees, our employees will act responsibly toward us. The no layoff program did not materialize out of thin air, it was designed as part of an integrated, comprehensive program to communicate the message that is, I believe, fundamental to our company philosophy and culture.

AMD is committed to its employees and we expect them to be committed to us. Putting it another way: demanding excellent performance, providing an environment where the employee is free to achieve that performance, and incentivizing the achievement of that performance is the soul of a successful business enterprise.

We stand today at the beginning of a new era, the information age. It is brain-intensive, and the company that succeeds in this era is the one that not only believes in it but also practices its responsibility to its employees.

Thank you.

[The prepared statement of Mr. Sanders follows:]

Prepared Statement of W.J. Sanders

Good morning,

I'm Jerry Sanders, Chief Executive Officer of Advanced Micro Devices. At AMD we believe that we and many of our sister high-tech companies are on the leading edge not only of technology, but also of employee relations. That combination has led to phenomenal results. On May 1st, AMD passed its 15th anniversary. During the current fiscal year, which ends in March, we expect in the neighborhood of $1 billion in sales. During the most recent five-year period, our compound annual growth rate has been nearly 31 percent -- and you'll recall that during two of those five years we were in a steep recession.

Today, AMD is the fifth-largest integrated circuit producer in the U.S. and the ninth-largest in the world. We are the fastest-growing of all major U.S. semiconductor producers. In our most recent fiscal year, sales increased 63 percent over the prior year; and in the first quarter of this year - the quarter that ended in June -- sales were up 117 percent.

In terms of productivity, AMD and the semiconductor industry as a whole are far ahead of industry generally. For the most recent five-year period, 1978 through 1983, the total sales per man-hour increased an average of only .6 percent in the U.S. non-farm sector. The median for the semiconductor industry, on the other hand, grew an average of 11.3 percent.

What's the secret of our success? In a word, people. A dedicated loyal work force. I believe that if a company takes care of its people, its people will take care of the company. If you want loyalty from your employee, you must first demonstrate loyalty to them. As I've said many times, people first--products and profits will follow.

Good employee relations are fundamental to continuing business success. Let's look at some of the things that contribute to achieving such relations.

One of the reasons AMD has good employee relations is because we are an expanding enterprise. Fundamental employee relations involves the promise of an environment that will improve the worker's economic condition. It is more difficult for someone to improve his or her economic condition if the enterprise they are associated with is not experiencing continued improvements in its economic condition. So to me, the foremost principle of employee relations is aligning the goals of the employees with the growth goals of the company. I think the centerpiece of any employee relations program is enabling workers to identify with and participate in the success of the company. It is impossible to align worker and company goals without giving employees a "piece of the action." That means, at a minimum, profit sharing that ties the improvement of employees' economic conditions to improvement in the corporate economic condition in such a way that they understand that when the company does well, so do they.

In Silicon Valley, it someone wants to change jobs all they have to do is turn into a different parking lot in the morning. So if a company wants to retain its work force it must offer something extra. One of the extras AMD offers is security. We were the first company in the industry to make a no-layoff program a matter of policy. If an employee meets and continues to meet our high standards, his or her job is secure.

Employees must feel an identity with their company and with their company's goals. If they do, then they will also have pride in the company's achievements. People want to work for organizations they feel good about. Employees spend the bulk of their waking hours at the company, and they want to be proud of it. AMD has extremely high quality standards. To achieve these standards, our people must have pride in what they do. Most workers really want to do their work well -- with pride -- and they will respect a company's belief in quality. They will involve themselves in it.

An employee wants to believe that the company he or she works for has the right stuff. That means knowing that the company cares about its workers and about the community where they live. Your employees have to trust you. One of the ways to get that to happen is through open communication. When a difficult issue arises, you have to meet it head-on. That means you let the employees know what's going on, too. For example, in June, a water quality issue in the Sunnyvale area, where a number of high tech companies are concentrated, gained a lot of exposure in the local press. The issue involved was previous chemical leakage from underground storage. In my absence AMD's chief operating officer quickly distributed to all managers, to pass on to their employees, a detailed explanation of the problem and the measures the company had taken to correct it. We let our employees know that we are responsible corporate citizens. We told employees that we took the initiative. The company discovered the leaks and reported them to government authorities. And we took steps to prevent further leakage and contain any existing contamination. We wanted our employees to know what the situation was, and what their company had done about it. We wanted them to know that their company cares about the environment in the communities where we, and they live.

At our facilities in Texas, for example, the water we use in our manufacturing operations is actually cleaner going out of the plant than it was when it came in. Using processes involving reverse osmosis, neutralization and filtration, there is less particulate matter and a more neutral acidity level in our waste water than there was when it first entered the plant as so-called "safe drinking water." In fact, we are going beyond that to begin a pilot project involving water reclamation and conservation so that we can re-use that water on a regular production basis. We do a small amount of this now, and it is a very costly process.

We show our commitment to our employees in many other ways as well. For example, the employee assistance program provides an employee and his family members with free counseling services for any type of personal problem on a strictly confidential basis. In addition, we know that we must provide excellent medical, dental, life, and disability insurance, and educational assistance, simply to remain competitive.

But as I said earlier, it is financial incentives that do the most toward aligning employee's objectives with those of the company. To that end, we have a stock purchase program that allows employees to purchase stock at a discount. The profit sharing program I mentioned earlier features cash distributions twice each year, plus credit to each employee's deferred compensation account. This year we are adding an additional incentive. We set sales targets of $400 million and $500 million, respectively, for the first and second half of this fiscal year. If we make those targets, each employee receives an extra week's pay for each half of the fiscal year in which we met the target. When you consider the fact that our most recent profit sharing cash payout represented more than three weeks of extra pay for each eligible employee, these additional incentives begin to look quite significant. So, improving the employee's economic condition and security are key and progressive employee relations programs must revolve around that principle.

Underlying everything we do is the belief that if we act responsibly toward our employees, our employees will act responsibly toward us. The no-layoff program did not materialize out of thin air. It was designed as part of an integrated, comprehensive program to communicate the message that is, I believe, fundamental to our company philosophy and culture: AMD is committed to its employees, and we expect them to be committed to AMD.

We stand today at the beginning of a new era -- the information age. The company that will succeed in this era is one that not only believes in, but also *practices*, its responsibility to its people.

Thank you.

Representative **Lungren**. Thank you.

The third member of the panel is Mr. Walter Loewenstern, Jr., vice president of ROLM Corp. Welcome.

STATEMENT OF WALTER LOEWENSTERN, JR., VICE PRESIDENT, ROLM CORP., SANTA CLARA, CA

Mr. **Loewenstern**. Thank you.

I'll try to make my remarks short, since I've got about an hour with you folks. You have my prepared statement.

First of all, I certainly agree with what the panelists have already said. Let me just give you a little different view. When we started our company we decided that one of our objectives of the company would be to make a company where people enjoyed working.

And in our view we had worked in companies which had the more traditional values and we decided that it might be interesting to have a company where people enjoyed working. And so we set that as an objective, merely because we wanted to. And I think has worked out.

We've received the advantages that the other panelists have talked about; we have an efficient company since things seem to go better when there's less conflict. Now, how do we have a place where people enjoy working?

I think the real key is that we treat each other as mature, capable individuals at all levels within the company. And that sounds very simple. But I think many enterprises in this company are built on the parent-child relationship, rather than the adult-adult relationship. And I think you'll see that when you come to visit us this afternoon.

I don't want to say too much more about that, other than that we try to have some unusual benefits for each of us. After someone has worked for our company for 7 years you get a 3-month paid sabbatical program, no matter what level of the program you work in. We have other benefits like profit-sharing, stock option plans, et cetera.

I'd like now to skip and talk about what you in Congress can do for us, or not do for us, that may help this sort of thing continue. I think the main area is tax policy, and that's already been talked about by the previous panel. And I want to reemphasize some of the points that they made.

First of all, the capital gains tax, of course, the lowering of that tax, was a tremendous boost to the country and to our industries by the generation of large amounts of venture capital.

There is something that hasn't been talked about that I think is directly applicable to this panel. There is a move now by the IRS, and it's being backed by some Members of Congress, to tax fringe benefits. I think that would be a very big mistake.

And, in fact, some of that has already been done. There have been some caps on fringe benefits; there is a limit on rollover of fringe benefits from one year to another. I think that's exactly the wrong area for Congress to be working on.

Fringe benefits are usually provided without respect to position in a company. These are the things that level the differences in companies between management and labor. I think that's a big mistake to be putting caps on fringe benefits.

Artificial ceilings by the Government regulation on benefits wind up being disincentives to all benefit programs and hurt everyone. Please, don't do it.

The tax treatment of stock options is an area that's been suggested already. The stock option tax treatment has become so complicated that very few of us really understand it. As a result it's no longer as much a motivational factor as it was in the past.

And this area is one in which we motivate the truly creative people in our industry to continue to create and to do the things we want them to do, both for small companies and large companies. I think it's important that we return the treatment of stock options to the simplified treatment that we had in the 1950's. And the way they are complicated now, very few of us truly understand them and they become less of a motivational factor for our employees.

I think we should provide tax advantages for hiring of the handicapped and the low skilled individual. This would help to offset the training and accommodation cost that we have for hiring these individuals.

In the area of employee motivation, we need more transportation money in this valley. We're strangling on traffic.

A couple of other things: As mentioned before, the R&D tax credits do work; let's keep them. The Simpson-Mazzoli bill, I'll also address that because that's an area of motivation. We find some of our more creative people are indeed foreign nationals who have gone to our universities. To send them back to their own countries would be a big mistake. Let's not do it.

Supporting of the university system is important. I think one of the reasons that we're in this valley is due to the very fine universities we have, as was mentioned previously. The difference between this valley, perhaps, and Route 128 is that industry was not quite as closely coupled in the past as they are here. They probably are now, and I think Route 128 will emulate this valley and succeed as much as we have.

Finally, in answer to the question of should the United States have an industrial policy: Of course, we have one, and the things that I've talked about are our industrial policy. But the industrial policy with a big "I," where someone—either Government or industry—picks winners and losers, that's a big mistake and we don't need it, and I strongly suggest that we don't have it.

I skipped one point that I do want to make, and that is that something we don't need from Government is a Small Business Administration; we don't need small business programs. I don't think any of the successful companies in this valley—if we used any of those benefits it was incidental to the success of these companies, and many GAO studies have shown that the small business-type programs don't work. They support inefficient industries, and we ought to get rid of them and use that money to support some of the other things that I've talked about.

Thank you very much.

[The prepared statement of Mr. Loewenstern follows:]

PREPARED STATEMENT OF WALTER LOEWENSTERN, JR.

My name is Walter Loewenstern, Jr. I am one of the founders of the ROLM Corportion. Our company has grown in a period of 15 years to over $600 million in sales with over 9,000 employees. We are a manufacturer of computers for military applications, and telecommunication products. As you will see when you visit our company this afternoon, we are well known for our positive working environment. Therefore, we feel well qualified to address the subject of employee relations and motivation. In my talk today, I will suggest specific actions that congress can take which will encourage our type of company.

Our company has four goals. They are: to make a profit, to grow, to manufacture quality products, and to create a great place to work. The four goals are interrelated. One cannot exist without the other. The goal of a great place to work is achieved by each of us in the company treating each other as mature, capable individuals. This sounds simple, but I'm sure you are aware that many enterprises in this country are built on a parent-child type of interaction.

A tradition of companies like ours seems to be happening in the Santa Clara valley. Some of this is due to competitive pressures among companies to attract employees. We are very pleased with this development, whatever the reason.

ROLM offers its employees the following incentives and motivational programs:

Medical and Dental reimhursement plans for employees and their families.

A stock purchase plan so that all employees can become owners of the company.

A cash profit sharing plan.

A recreation center for employees and their families.

Stock option plans for key contributors who are responsihle for the phenomenal growth of the company.

Picnics for employees and their families.

A sabattical program which allows every employee to take three months off, with pay, every seventh year.

Attractive physical facilities in which to work.

Now let me suggest what I think you can do to help us. It seems to me a key area where congress can help is in tax policy.

When congress lowered the capital gains tax, it created large amounts of venture capital. This in turn created the opportunity for new and exciting companies like ours. Please keep the capital gains tax low.

There are some moves by congress and the IRS to tax fringe benefits. This would be a big mistake. Taxing fringe benefits would discourage us from using them as motivational incentives for our employees. In addition, there is talk of putting a tax cap on all fringe benefits. this tends to discourage us from implmenting a very positive plan. Fringe benefits usually are provided without respect to position in the company. Successful modern companies need motivated, capable employees at all levels. Artificial ceilings on benefits set by government regulation wind up being disincentives to all benefit programs and hurt everyone.

The tax treatment of stock options is another area where congress can help. The entrepreneurial spirit burns a bit in all of us. Stock options are a way to kindle that spirit in both large and small companies. The entire economy is the ultimate benefactor of these programs which tend to be quite widespread in most of our vibrant, young industries. However, the current tax treatment of stock options has decreased their usefulness as a motivational tool. We should return to the simple stock option treatment of the 1950's.

Tax advantages could be provided for hiring of the handicapped, and the low skilled individual. This would help to offset the training and accommodation costs for employing these individuals.

Finally, in the area of emploee motivation, we need more transportation money! The current commute situation in this valley is very discouraging to a large portion of the working population. Unless we do something quickly, we may strangle in the traffic jams.

I would like to offer my opinion on a couple of other actions of congress. These are not directly related to employee motivation but to other issues affecting companies like us.

The R&D tax credits work, let's keep them.

Get rid of the small business administration, and all "small busines programs." Eliminate all set-aside procurement regulations. Numerous GAO studies show that they don't work. Use the money saved to fund the other objectives that I've mentioned.

Finally, in answer to the question "Should the U.S. have an industrial policy?" I say no, absolutely not. Such a policy has never worked, and it never will!!

Thank you.

Representative **LUNGREN**. Thank you very much.

We'll try and do about 7 minutes a piece for questions and see how that works out at the beginning.

First of all, Mr. Sporck, in reading over your testimony you talk about participative management. We often see the press reporting that the Japanese use this concept; and can Americans learn to do that? And some joint ventures between American and Japanese automobile manufacturers are based in part on the ability of us to somehow take that from them and bring it over here.

You've indicated that your company is involved in that. Can you describe that in some detail? And to what extent is it a reality? What types of decisions are truly participatory?

And I guess, the reason I ask that question is that I think there's a concept among some people that it looks like something that may take place after the fact. How do you insure that there is a feeling of participation as far as the employees are concerned with respect to management? And has it actually worked out in specific instances to give you a better product or a better process?

Mr. **SPORCK**. Yes, I don't particularly like to relate it to what the Japanese do. I think that their approach is participatory. However, it's a somewhat different approach than we are pursuing.

Basically what we're talking about is to try, at the various levels in the company, to address the problems in a participative fashion. It might be a particular yield problem in a process in a wafer fab area where the group that is processing that product work in a fairly formal structured manner potential solutions to that yield problem.

We have very specific arrangements for going through a series of steps to arrive at the right decision that would impact that yield. And there are a number of decisions that you might end up with, with various priorities, on those decisions.

But the people themselves, the people in that group, address that problem with this structured roadway to follow down. It might be at a considerably higher level in the organization where a decision to invest in a very major new process, a very large fiscal impact on the company, would be considered through considerable exercising on the part of people in the company prior to the decision being arrived at.

Basically, what it comes down to is an approach to management style which is more of a consensus—and I hesitate using the term "consensus," since it's been, you know, given to the Japanese over the past few years so completely—but a consensus being arrived at through exercising alternatives from the bottom up, as opposed to a dictatorial approach from the top down.

I think we are very good at that. We have been following this course now for the past 5 or 6 years, we've set up systems which in fact stimulate that approach. I think one of the reasons why it works well in our environment here is that by and large much of the management, our managements that came up through the companies—whether they came up through marketing or came up through operations, what have you—have a confidence in the ability of the people to arrive at a sensible conclusion, given an opportunity to participate. If you look at many of the traditional company backgrounds, their managements came in at a considerably higher level and really didn't go through the exposure level of the inner workings of the company.

And, finally, I think that we're very good at that practice.

Representative LUNGREN. Mr. Sanders, do you have a similar type approach in your company with respect to this issue?

Mr. SANDERS. Well, I'm glad you gave me a chance to answer that, because it is one of my favorite subjects. I'll try to be brief.

I think that it's people first and then products and profits will follow. So you have to organize in an entrepreneurial fashion. That means that after you get the structure—we call them at AMD managing directorates; someplace else they might call them a P&L center—we think of it as a center of innovation.

The managing director is charged with the responsibility for the profit and loss of an individual product line. He is also charged with introducing new products, that's his first and foremost charge.

Now, this is an interesting dichotomy because the more you spend on development—and AMD spent 16 percent of sales in R&D over the last 5 years, over $100 million a year currently, $150 million this year. So we've got these guys trying to have a P&L management responsibility, and then beating them over the head—participating with beating them over the head—with their employees to come out with new products.

So the way we do this is we set up a lot of these entrepreneurial centers. At AMD we have 14 of these centers. And under these centers we have something we call product managers. We have subsets of these product groups. These product managers are budding managing directors; the managing directors are budding division vice presidents; the division vice presidents are budding Jerry Sanders.

So the bottom line is that each guy has a charge and he's got a responsibility for new products and profit and loss. However, his incentive, his compensation, is approximately one-third based on corporate performance. To me this is the real key.

Most companies traditionally pit one P&L center against another P&L center and incentivize them with their incomes that way. This to me is destructive; nobody cooperates. However, if everybody knows that their profit, that the incentive that they get, will be based on the corporate performance we raise their threshold of consciousness to the corporate level while still appealing to their natural sense of competition.

So they want to have better results than the other guy, more new products, a better P&L, but they aren't penalized for it. So we get a sense of cooperation.

Now, what this means is that with 14 P&L centers and 5 divisions, how do you interact? And we set up councils. For example, a high technology council, or a design council for CAD. And peers from these various groups talk to one another. Engineers are fundamentally introverts, so they don't like to get up in front of large groups and make fools of themselves. However, they love to share the benefit of other people's knowledge.

So getting them together in these councils, they talk to one another. No one ever admits who is better, but they go away and everybody is elevated. That's what I see as participative management, participating in the rewards of the enterprise by having a structure where the total corporate success results in compensation on that basis; competing on the basis of new products and financial results; and finally, a matrix organization among the technical people, interact with one another so that the group that comes up with the best idea perseveres.

For example, at the current time we have five different groups developing CMOS technology. Those five groups participate, they don't compete. They participate and what happens is—because engineers, besides being introverts, are extremely logical minds—in the limit they'll go for the best solution.

So I think you have to get the participation going, as Charlie said, where it's cooperative, it's encouraged, it's in a nurturing environment. If you can do that the employees feel like they've got a say in what's happening. And moreover, they're focused on what's right, not who is right.

And this evolves political—if you'll excuse the pun—machinations: Rather it's. "Who has got the best solution?" And in engineering many times results speak for themselves.

Representative **Lungren**. Mr. Loewenstern.

Mr. **Loewenstern**. Well, I don't really have anything to add as far as internal to the company. I think we have similar kinds of systems within our company where we treat each other, again, as mature, capable individuals.

I think there is one point that I would like to make, though, vis-a-vis the Japanese. It seems to me that the Japanese are very good at one particular area, and that's manufacturing. And we're very good at a little different area, and that area is innovation. And I think that's built into our society and the way we're brought up and not built into the Japanese society.

And I think there's a danger of trying to emulate the Japanese, and we ought to be careful that we don't kill the goose that laid the golden egg. And let's not get in the way of innovation. And, again, I think this falls back on tax policy and making sure that innovation is rewarded.

And, you know, I'm not sure that we're ever going to be as good as the Japanese at manufacturing, but I'm not sure it really matters. I think we're learning from the Japanese and we're trying to do so as well as they're doing, but we're good at what we can do and that's innovation, and starting new companies, and making companies grow and be innovative.

And, in fact, they're coming over to study us. We're getting delegations all the time studying how we've done, what we've done and how they do it. Let's not get in the way of that, let's keep that going.

Representative **Lungren**. Congressman MacKay.

Representative **MacKay**. Mr. Sanders, I'm very interested in your no layoff policy. Once again, I'm trying to look at Silicon Valley to see—whether you like it or not, you saw the pilot project perhaps for a future of this country which could keep us committed to competitiveness, innovativeness and not have us find ourselves more and more fearful and putting up walls and trying not to be free market competition anymore.

And one of the things that you're suggesting, it seems to me, is that in order to do that we've got to bring everybody along. We can't in a democracy sell a vision of success which excludes as majority of our citizens, it won't sell. By definition, we won't be able to get elected trying to sell it.

It seems to me that this means that we've got to have policies at the national level which would change the friend instead of the threat to the working person. And one of the areas, it seems to me, where our policy is antiquated—going back to the idea of what do we need to change if you wanted to define industrial policy as a policy which would enable us to be competitive at an international level—it would seem to me that we need to develop a policy that would cushion our work force against the impact of structural change, structional unemployment.

We now have an unemployment comp system which cushions against, you might say, cyclical. But there is nothing there for the guy whose job is outmoded or for the guy—I agree companies should be allowed to fail. What should be the consequences of that failure to their employees who are in midcareer?

Now, I'd like to know from you, all of whom are free enterprise people—and I don't disagree with your philosophy—is it not an investment in the future to develop the next generation of an Unemployment Comp system so that a man's entire self-worth as an individual, his entire career and everything doesn't go down the tubes when his company either becomes outmoded or makes a strategic error?

And I'm not sure it's a job training credit or all the things that are in the offer now, but what kind of thoughts would a free enterprise entrepreneurial person endure from the politicians who say, "Wait a minute, we've got to do this in order for you to succeed"?

Mr. Sanders. Well, let me respond to that. It's a very complex issue, as you well know. I certainly don't have all the answers. I'm not sure I even have the beginning of an answer.

I do have a belief. And I believe that an enlightened society—and I believe America is an enlightened society—has a responsibility to its citizens to provide the safety net below which none may fall, and a ladder up which all may climb. My concern is that our policies seem to be dedicated toward improving the safety net while truncating the ladder.

My view is that the only way that we can raise the safety net, which means to provide compensation and benefits to people whose careers are limited or terminated by events—we can't change the world, it's inevitable. I mean, the agrarian society gave way to the industrial society; the industrial society will give way to the information age. We can't stop that, all we can do is ameliorate it.

And it seems to me that the way we can raise the net is by providing more ladders to climb. That's where the wealth will be created. So, I would rather see us focus—right now we keep truncating those ladders. This latest round of nonsense on what kind of cars companies can lease for their employees—you would be amazed at the, not 1, not the 10, but the hundreds of AMD employees who came into me and said, "I can't believe I'm paying 55½ percent taxes on my stock options."

And in case you don't know how that is, it's 50 percent Federal, 11 percent State, half of which is deductible. And, boy, everybody finds it out real soon. And it doesn't take very much money: 44,000 bucks and bang, 55½ percent, and the eyes are open.

And so what does everybody want? They want a company car because that's a tax benefit that they don't have to pay: "Don't give me a raise, give me a company car." We were in company cars in the last round.

So all I think we're doing is we're finding ways to destroy incentive for middle management. You know, we're asking people to work long, hard hours. So, with that little diatribe aside, this is the wrong thing. As Mr. Loewenstern said, we're destroying incentive for the $25,000 and up employee. We've already destroyed the incentive for me.

Representative **MacKay**. See, I don't disagree with that. But I'm trying to ask you to think about a different question, and that is: Is our safety net archaic?

Mr. **Sanders**. I think our safety net is archaic. There is no question in my mind of that. And I think that——

Representative **MacKay**. Should an employer as a matter of public policy be required to make some commitment to his employees other than paying into the insurance system which will keep the guy alive for 6 months or 12 months, and so forth?

Mr. **Sanders**. No, I really believe the marketplace is the great purifier. I think that the successful companies will recognize that a good work force is what makes them successful. As far as what do we do with the —well, for example, in this morning's newspaper, a fine company, AT&T Technologies, announced they're going to reduce their work force by 11,000—or 110,000, the numbers are so big I can't remember.

Mr. **Sporck**. Eleven-thousand.

Mr. **Sanders**. Eleven-thousand. Thanks, Charlie.

And I thought, "What am I going to respond to, how can a company like AT&T Technologies do this, aren't they an enlightened company? And the answer is: Yes, they're an enlightened company. It has suddenly been thrust into the real world and they're not competitive.

The important thing with the no layoff policy is: Don't start it when you're not competitive, start it from the beginning and then you can perpetuate it. And it's an incentive to hire the best people and to be discriminating in their progress.

So what do you do with those 11,000 people? These aren't steelworkers, these are people who are excess relative to being competitive in the world economy. My view is the best thing you can do is provide fair trading environments with our major trading partner, Japan.

Representative **MacKay**. Do you think you could sell that for those 11,000 people in an election campaign?

Mr. **Sanders**. That's why I'm not in politics.

Representative **MacKay**. No; but that's not a good answer.

Mr. **Sanders**. No; it's not a good answer.

The good answer, I believe, is that we have to communicate honestly that the reason that we can't employ all the people we used to at the wages we used to pay is because the rest of the world has caught up with us in many areas technically and are prepared to work harder for less. And we can get mad about it and we can get angry about it, but you can't change reality.

The Koreans are coming, the Japanese are here, that's the future. So I think that one thing we have to start doing to the people, what we do with our people is we tell them, "If there are no profits there is no profit-sharing." And that's the reality.

We give 1 percent of our pretax profits to charity. And I'm amazed at the charities—when business was down in the recession and our profits were down we told them we were cutting them back and they were stunned: "How can that be?" But they love it every time the 1 percent gets bigger

But we have to train the world. I think we have a responsibility that when we benefit, everyone benefits; when we don't benefit, we can't continue to sell the seed corn. There won't be any future. And I think the real issue has to be to invest for the future, as our industry does. And I could only say that we do have to revamp the safety net in this country.

I think that, at the risk of forever closing any political avenues for me, we have a middle-class welfare system in this Nation that we cannot endure with.

Representative MacKay. Thank you.

Mr. Sporck. I have a couple of comments.

The concern I have in this area relates to major structural changes. I think our prime objective should be to stimulate growth. But after saying that, there are going to be certain industries that are obsoleted. We saw the sort of peripheral impact of that in the automotive industry in the last recession. I say obsoleted, either by going offshore for supply, or truly obsoleted like, you know, the buggy whip.

And something has to be done to accomplish two things: First, to modify that rate of change; and second, to address what are you going to do with those people. Because it isn't enough to say, "Let's stimulate Silicon Valley and to hell with the thousands of people that are laid off in Detroit." That's just plain not adequate.

And I don't know—I hesitate to throw it out, but I have a feeling that you people must address that because it may very well be that we have only seen the tip of the iceberg in terms of the rate of obsolescence of skills out there.

Representative MacKay. See, what the problem is——

Mr. Sporck. Jerry mentioned earlier the transition from the agricultural society to the industrial. That was a transition but the employment levels went up. The next transition to the Information Age may very well be a dramatic reduction in the number of of people needed to run industry.

And I don't know how you cope with that, you know, given our prior approaches.

Representative MacKay. That's a problem of the future. You all are creating it, you're coping with it 10 to 20 years ahead of the rest of society. You've got to help us get the private sector ready for that reality or else we're we're all going to face a problem that we can't deal with, which is, once again, a fearful constituency demanding that we stop change because they see change as a threat.

Thank you.

Representative Lungren. Congressman Zschau.

Representative Zschau. Thank you, Congressman Lungren.

I'd like to follow up on that and ask Charlie Sporck if there is any evidence to indicate that there may be a break from history? That is, historically innovation and change has resulted in economic growth, more jobs, higher standards of living. Is there any evidence that you've been able to identify so far that would indicate that the future would not be like the past and that change and innovation could cause a reduction in opportunity?

Mr. **Sporck**. Well, I'll tell you, I've always believed that innovation really results in more employment. Maybe you go to a—you dramatically reduce the labor in each item you build but you build a lot more of them because the price is lower, and what have you. I've always believed that.

The part that is starting to worry me, aside from the competition that impacts us from overseas, is the progress we're making in the area of applying our technology. It is getting to the stage where it truly has the ability to eliminate people in the manufacturing of goods. We've been talking about that for a long time, but I can see, looking at our own operations in terms of the procedures we're going through to get at cost improvements and quality improvements, what have you, the result is potential enormous reductions in population.

And that's not just at the hourly level, because that's been happening for some time, but in the indirect areas. Much of that work will occur automatically. And I have a feeling that this application is now accelerating such that we're going to see a very major discontinuity in terms of, you know, available jobs.

Representative **Zschau**. The same sort of concern was voiced in the 1950's and early 1960's when the computer revolution began to take over and we were concerned that computers would replace people. I'm not sure that that turned out to be the case.

Would you expect that at National you would actually have, if you were able to continue your growth, fewer employees overall?

Mr. **Sporck**. I think the answer to that—I realize that, you know, in the 1950's we felt that way. What we really didn't anticipate is the impact of two things: We didn't realize that the application of the computers didn't really reduce the work involved in running a business; and second, we didn't realize the stimulation that the great reduction in cost per performance, was going to have in terms of the demand on product.

But talking about National, I am absolutely convinced that after a bulge here over the next 2 to 3 years we will see a decline in employment, even though we're having a very substantial increase in the sales volume. That's already planned, that's going to happen.

Representative **Zschau**. Mr. Sanders.

Mr. **Sanders**. We're talking about two things here. One thing we're talking about is employment and the other thing we're talking about is growth. It seems to me that the essential issue here is to create new wealth. Our industry is involved in information in the broadest sense.

For the last 50 or 70 years—maybe it's been almost 100 years now—industry has been involved in producing products and transporting goods and materials and people back and forth. That's what has driven our society.

Now we're starting to create information and transmit and communicate information. So this is a new product, new goods and services, it now has value in the marketplace. Anything has value if someone will pay for it. So we are going to see, in my view, for the foreseeable future—and that means decades, if not centuries—we are going to see the creation of increased goods and services, that is, a rising GNP.

Therefore, we will be creating wealth. Charlie's point, I think, is the other side of that coin: We might not need as many people per dollar of GNP. And if the people requirement doesn't grow as fast as the GNP growth we will have more people and fewer jobs in the aggregrate; that is, we need a safety net and need some social change. People have to have more things to do with their free time.

My view is that if we manage it properly people will not object if their standard of living doesn't decline and they have more free time. I won't object and I can't imagine many other people objecting to an improving or a stable standard of living with more free time.

So we've got a social problem, to deal with two things: No. 1, a work force that is becoming obsolete—because independent of the change from the Industrial Age to the Information Age, we don't use as many pounds of steel in a car anymore, we don't use as much rubber in a tire anymore, we don't use as much glass, as much aluminum. We are using fewer measures of physical material to support each human being.

But if we can create wealth we can then create new markets. We've got a whole world of customers out there. There's a whole, you know, undeveloped world. If we create wealth we can create an economic trading system, and I'm sure these good gentlemen can help us with that. The important thing is to create wealth.

I would hope that when you go back to Washington that one thought you will take with you is that our industry creates wealth. We would like to be left with enough of that wealth to maintain our international competitiveness and to continue to grow.

Representative ZSCHAU. One of the topics that we in Congress have been focusing on, and it's certainly one that will be discussed during this election campaign, is the role of women in the work force and the way in which women are paid and treated versus men. And it's something that I would be interested in.

Walter, what sorts of things have you done at ROLM Corp.? Is there a pay equity? What kind of opportunities are there, and do you feel a need for legislation in the area of comparable pay for comparable work?

Mr. LOEWENSTERN. Well, that's a tough question.

You know, it's interesting, I think we've made a lot of progress in this problem in the last few years. We still have a good ways to go. I think we've made enough progress when we won't have to talk about it anymore.

But, I think early in our company's development it was pointed out to us actually by the women in the company that perhaps things weren't quite as equal as we thought they might be. And the management of the company, all of us sort of took a look at that and instituted some programs of giving women within the company more opportunity, promoting women within the company, that sort of thing.

And we have been very successful to that to where today things look pretty good in the company. We have certainly at least 50 percent women as total employees. In management we're not doing as well as we'd like, but our percentages are quite high. And we do monitor those things and we look at the question of pay for the same job.

I would hate to see the Government legislate this type of thing. I believe that in the past the bureaucracies built up to administer these types of programs have not worked very well, that they typically have not accomplished the goal.

I think it's more important that we encourage people to do the right things. I would hate to see legislation of comparable work. I think that doesn't work because you're really talking about supply and demand. And I think we all get paid in accordance with what the supply and demand factors are.

To try to distort this through legislation, I think, would be a very large mistake. Instead, we need to educate people. If a certain job which happens to be predominantly women is low pay it's typically because there are too many people that can do that job. and we're better off encouraging those women to seek other types of careers, and making it easy for them to do so.

And so I would hesitate to legislate in this type of thing.

Representative **Zschau**. Finally, one other comment made by Bob Noyce on the prior panel was a comment about the percentage of foreign-educated, foreign-born—and perhaps secondary school-educated—professionals that his company hires. and I think he made the comment that these are the best people. and I was curious if any of you would want to comment on your assessment of the quality of the U.S. work force, taking into account the public school education and so forth, versus individuals in the work force that come from foreign countries.

And if there is a difference, and if it's not in our direction, what kind of suggestions might you want to offer?

Mr. **Sporck**. I'll comment on that.

To give you another figure, we had a review of our college recruiting program here the middle of last week and I was amazed to hear that of last year's graduating class for bachelor's of electrical engineering 50 percent were non-American citizens. In the entire country, the graduating class in electrical engineering 50 percent, or greater than 50 percent, were non-U.S. citizens, which I think ought to blow our minds.

Clearly, we hire—as I think all companies in the valley do—a large number of foreign nationals of the technical background. And I think basically the reason for that is that 50 percent of the total output. And I think that's related to how we have conducted our high school educational efforts in the past.

You know, focusing on the—in my opinion—nondifficult courses, as opposed to those courses that are necessary in order to involve oneself in a very disciplined, very difficult, very technically oriented college education. And consequently, we don't have anywhere near the number of students going into those disciplines.

There is a secondary factor there, and that is that the colleges themselves don't provide enough openings for the demand that does exist. And second, many of those colleges prefer to have a spread of students from not just the United States but outside the United States. Even State schools that are supported by our taxes take that approach.

Representative ZSCHAU. Anybody else want to comment on that?

Mr. SANDERS. Well, this is a concern. I guess it really just shows that the American system works, the American dream lives. The reason these foreign students come to America is because we have a transparent society.

My experience has been with our foreign nationals who graduated from Berkeley or Stanford or MIT or University of Illinois or the best engineering schools is that they're extraordinarily bright people who felt that their rise in their own environment, be it Hong Kong or the Philippines or anywhere else, would be limited.

And therefore coming to America, in a transparent society they could go as far as their abilities and their efforts would take them. And so, I mean, that makes them extremely competitive. We're getting some of the best brains in the world and they're emigrating to this Nation.

So just as we prospered from immigration in the Industrial Age, I think we'll prosper in the Information Age by the immigration of these bright minds, independent of country of origin. I don't think it's something to be concerned about, other than the fact we don't have enough places in the engineering universities. That's the concern to us.

And as a result, because you're getting perhaps the cream of the international community coming over to go to engineering school, it crowds out some places for Americans. I don't think that it would be consistent with the American system to deny that.

I must admit I'm ambivalent on it. I don't like to see all of our State university places go to foreign nationals. That doesn't seem fair to me since we support them with taxes and they don't. But I think that to deny ourselves and our country the right to those minds would be shortsighted.

Representative ZSCHAU. Well, you say that it's something that we shouldn't be concerned about, but the people who are unfortunate enough to be born in this country should maybe——

Mr. SANDERS. It's not so bad.

Representative ZSCHAU [continuing]. Would want to be concerned about it. It appears that we may have highlighted a problem here. That is, the secondary school education that an American citizen gets and whatever motivation there is associated with it may not be comparable, at least in the scientific fields, to what people in other countries are getting.

Mr. SANDERS. Clearly, you're right. And as you know, we supported a change in superintendent of public instruction in this State to get more science and math in the secondary schools and to get an education more aligned toward the future rather than easiness.

What I meant by "not to be concerned with it" was that so far the only concern we've seen evidenced by government was to deny American companies the right to employ such foreign nationals, thereby further choking off our supply of already short engineering talent. We can't hire enough engineers.

AMD's growth, and I'm sure the growth of my colleagues here, is limited by the availability of trained, qualified engineering personnel.

Representative ZSCHAU. Congressman Lungren, again, I have the privilege of calling these gentlemen by constituents and we get a chance to talk often. I yield back.

Representative LUNGREN. Thank you very much.

I'd like to pick up on that. As the ranking Republican on the House Judiciary Subcommittee on Immigration and working on the Simpson-Mazzoli bill, it's the Lungren-Frank amendment that changed the original bill. But let me just tell you some of the thinking behind it and tell you some of the concerns we have.

There was, in reviewing the entire immigration question—not in dealing specifically with high tech, but the whole question—we found that one of the best ways for people to circumvent the normal procedures was to come here on a student visa and after being here then get a job with some American company, whether it had to do with high tech or not. And suddenly you come to the front of the line instead of the back of the line.

And if you have an overall situation in which we're trying to treat people fairly, from around the world, you have some people that waited 10 years to get here and have every right to be here and they can't get here. But someone who gets to attend a school and then finds a job can stay.

So the original legislation said that if you came here on a student visa you had to return to your country of origin for 2 years and then make an application for a job and come under the regular procedure for certification.

It was brought to our attention by people in your industry that you rely very, very strongly on these individuals. It was also brought to our attention by the university community that they rely very much on foreign-born nationals for teaching positions. And we did a little further inquiry and we decided that it was appropriate to address that question.

But beyond that we tried to find out what the participation rate of minorities in this country is in these areas, and we found out that it's abysmal. And the reason why we have a sunset on that provision in the bill is not that we want to punish anybody, but we want to focus attention on the continuing problem that, yes, it is great that people from foreign countries come here. We want to get the best and the brightest from other countries here.

But something you said, Jerry, is very, very interesting: They come here because they see they can go as far as their talents can take them. That ought to also be the dream for the blacks and Hispanics in this country. And our concern is that somehow, someway our system is failing those folks.

And if through sunset legislation we require the educational community, and frankly your industry, to come back to us and make your case again we can gauge where we'd been if we had no changes. Have we made any changes in our secondary educational system? Have our institutions of higher learning done a better job of recruiting minorities? And if they're going to have 50 percent of their graduates from foreign countries what percentage do they have of the blacks and Hispanics in this country?

And I'm not saying that the colleges have to undo, that they have an obligation to undo, all the lack of proper training that those folks received in the lower levels. But I also know that your public schools are impacted tremendously by the influence of the colleges and the universities.

What if the colleges and universities start saying that a particular school district isn't going to get their people into that institution because they don't turn out a product that helps put the influence as well. I'm just concerned that unless we have all elements of society pushing our educational systems at all levels, we're not going to have the changes that we all are talking about.

And believe me, your industry, even though it may not have been speaking to Congress for a long period of time, did get us to make that change. And sunset is only so that we'll revisit it in a number of years and keep the pressure on.

Let me just ask you about one thing that all three of you talked about, and that is incentives. And you've talked about the motivational factor of, for instance, a company car or stock options and so forth if we don't make some changes.

There is a move afoot in the Congress to move to a flat tax rate. I don't think we're going to go to a total flat tax rate, but I do think we're going to move in 1985 in a very substantial way to a more simplified tax and one that compresses the number of different brackets that one can find themselves in.

And in the course of that there may be, in fact, some changes that will result in less of the ability to play with the tax system to create motivational factors. You certainly don't believe that there aren't other things that you can do to deal with the motivational factors; do you?

Mr. SANDERS. Well, I certainly don't think we play with the tax system.

Represetative LUNGREN. Oh, I'm not using that in a perjorative sense, but I mean it's out there.

Mr. SANDERS. No, but it really, really isn't. Because basically we're talking income. What we're talking, you have two choices: Create capital gains for the individual or create something which is termed income. The number of non—I mean, we could give everybody a bodyguard and call them a security risk, you know, but other than that—I don't know that they all want one.

There aren't a lot of things that we can do which don't show up somewhere as income. So my view on incentives is that we shouldn't—I agree with what Walter said: "We have turned stock options into a very complicated, highly taxed device significantly reducing its value to the employee."

Our employees find they have to now go borrow the money to exercise the stock options and then they have to sell more than half the stock to pay the taxes, then they have to sell a little more to pay the interest on the bridge loan. And if the objective is to get them to be an owner in America, which means an owner in corporate America owning some stock, then we're defeating that.

And I think that the ISO's went a good step in the right direction—not far enough, but at least a step in the right direction—and we pulled back most of the benefit of that, you know, just subsequently to that as a result of the next package of tax reform.

So relative to your first unstated question, I favor, we favor, a flat tax. I mean, there's just no queation about that. We're a high tax-paying industry I mean, my company will earn hundreds of millions of dollars this year and have an effective tax rate of over 35 percent. We're paying a lot of taxes.

Representative **LUNGREN**. No, but see, my question is that if we go to flat tax rate we may no longer have some of those things available to you which you now use as motivational factors.

Mr. **SANDERS**. Unless the flat tax is higher than 55.5 percent, we accept.

Representative **MACKAY**. Would the gentleman yield?

Representative **LUNGREN**. Certainly

Representative **MACKAY**. There is almost like a paradox here. My realization in discussing the flat tax with business constituencies in my district is that people haven't really though all the way through it. I'm not saying that in your case, because I think you have.

But the fact of the matter is: A flat tax, which reduces everybody's bracket, also reduces the value of all the incentives that you rely on. When many people find that out they say, "Well, wait a minute. Since I use these incentives very effectively relative to my competition, it's going to make those incentives less valuable." And people go away scratching their head about a flat tax.

I mean, obviously there will be a great shootout over the question of whether you keep a capital gains or not. On the other hand, if your top bracket is 30 percent maybe it doesn't matter all that much.

And these other incentives are the same. The price of the incentives has been this god-awful high bracket, narrow base issue. Do you feel from the high tech standpoint that you would be better off, would be less highly taxed relative to others if the brackets were significantly reduced at a cost of a lot of the incentives that we all cherish?

Mr. **SANDERS**. I don't thank that our incentives are as tied into tax brackets as you think. I think our incentives relate more to growth. If the company makes more profit each year and we always set aside 10 percent for profit sharing, then it's the growth that counts, not the tax rate.

I think in the area of stock options, where we're creating wealth, it turns out that the employees have been stunned to learn how 4 or 5 years of effort which have resulted in the earn-out of stock options are then cashed in and then this windfall, as some see it, is taxed at this top bracket level. And the employee doesn't quite see how that's fair.

I mean, he's worked for 5 years, he's earned these options, the company has prospered, taxes have been paid, and now he finds himself being taxed again. That, to me, would be ameliorated by a flat tax at some lower level. And I think it would also, frankly, avoid some highly contrived tax shelters which my employees get involved in, only to find out that over the period of years they've really saved nothing. And some promoters have made some money and some advocates have made some money, but it's not clear to me that the real producers of the wealth have made any money.

So I think a flat tax is certainly a step in the right direction, because with a minimum number of deductions that all can understand so that it's perceived by the country as fair, I think it could go a long way. And I don't think incentives will be reduced by the fact that we have a flat tax.

Representative LUNGREN. Mr. Sporck, I'd like to ask you a question with respect to—taking a little different tack on your assessment of where we are with respect to jobs, because I think we could really go into a long-ranging debate about where we are on jobs.

There's a misbelief in this country that we have suffered in the area of the manufacturing base employment-wise. In fact, in the last decade jobs in the manufacturing sector have increased. The U.S. economy with respect to export of manufacturing, we have a slightly higher percentage of the world market now than we did have 12 years ago, which surprises a lot of people. Real growth has taken place in the service side and that of information.

But what it seems to me the compelling thing is that there's a rapidity of change in the identity of the jobs that are available. And if, in fact, people are going to still work in the future for long periods of time, they're going to have to have an ability to perhaps change their work site in the nature of their job, which goes back to the question of the education that they received in the first place.

And in that I just wondered—because in your prepared statement you mentioned the training programs you have: The cooperation that you have with community colleges, adult vocational and technical educational programs, some onsite television courses from the major universities, et cetera; this you involve your people in training to help them do their job and to stay ahead of it.

My question is that: Have you observed on behalf of your employees—I don't know if I'd use the word "enthusiasm" but an inclination to be involved in training programs because they understand it is, in fact, necessary for their continuation of their jobs and their ability to work in the future, or is it more of a thing that this is what the company sponsors and wants us to do?

The reason I ask that is this: It seems to me we're going to have to change the attitude of the American people with respect to their ability to work in the future. And if they're going to be successful, it seems to me, 10 or 20 years from now we're going to have a confidence built in based on their already existing training so that they have confidence they can move to a particular job because they can pick up the skills because we've trained them in that regard.

Have you seen that sort of acceptance of that type of continuing training among your employees, or are we still some ways away from that?

Mr. SPORCK. I guess the way I would answer that is that it is my feeling that most of the people in the bay area—and certainly the people at National—have a great deal of ambition to improve their earning capacity, to improve their position in the companies they work for and the industry, what have you.

So they react very favorably to training opportunities. It is not a difficult exercise and it's a sincere effort on their part because they are very much committed to their future and their future progress. And I don't anticipate—speaking about our company, and our industry by and large—I don't anticipate a dramatic dislocation from the standpoint of automation coming out and wiping out jobs in a short period of time.

I guess what I was referring to earlier is the concern I have of industries outside of our industry, the impact there. And what did you train the auto assembler to—I mean, what training do you give him? It's not immediately obvious, if, in fact, that assembly line is going to shut down there 3 years from now.

It's one thing for us to train people, and what we're referring to there is training people in our companies for improved jobs in our companies. The problem I don't think comes from that area, the problem comes for those industries where the jobs and the business is going to be eliminated.

Representative **Lungren**. And one of the biggest questions you have is, if you've been working at a wage of, let's say, $10 or $15 an hour in an industry that is no longer competitive you may be able to find a job, but you'll find a job at $5 an hour.

And how do you prepare people for that if they don't have the ability to retrain themselves? And I suppose that goes back to the question of one of the differences we do have with Japan where I'd like to follow what Japan does, which is very much higher participation in savings than we have. And if you have savings and investment perhaps you prepare yourself for the period of time when you might be getting a job at a lower wage, or you prepare yourself to utilize those resources for retraining so you can move on.

That's something we haven't had to worry about in this country for a period of time, but we're going to have to in the future.

Mr. **Sporck**. We're certainly all in favor of doing something to stimulate savings, as the Japanese have done. And one other thing that the Japanese do, by the way, is they make damn sure that there are no dramatic changes in structure. They would never have tolerated what happened during the recession to the automobile industry. That would not happen in Japan. They would make damn sure that things were a lot smoother than what occurred to us.

Representative **Lungren**. Any further questions? [No response.]

Well, I want to thank the three of you for taking your time to make your presentations to us. This is a fascinating issue; it has many, many facets. And we want to thank you for helping us stay close to the subject area that we established for today.

Thank you very much.

[Whereupon, at 12 noon, the committee recessed, to reconvene at 9 a.m., Tuesday, August 28, 1984.]

A SILICON VALLEY PERSPECTIVE

TUESDAY, AUGUST 28, 1984

CONGRESS OF THE UNITED STATES,
JOINT ECONOMIC COMMITTEE,
Washington, DC.

The committee met, pursuant to recess, at 9 a.m., in the city council chambers, city hall, 456 West Olive Street, Sunnyvale, CA, Hon. Daniel E. Lungren (member of the committee) presiding.

Present: Representatives Lungren, MacKay, and Zschau.

Also present: Charles H. Bradford, assistant director; and Robert Premus, professional staff member.

OPENING STATEMENT OF REPRESENTATIVE LUNGREN, PRESIDING

Representative LUNGREN. Good morning and welcome to the second day of our hearings here in Sunnyvale. The committee is examining our overall question of the nature and extent of lessons that we might be able to learn from both this location, as well as Route 128 later in this week, to guide us with specific public policy decisions.

Launching new companies and seeing them prosper and grow is the function of the entrepreneur in our free enterprise economy. The importance of entrepreneurs to our economy and an environment that encourages entrepreneurship and innovation cannot be overstressed. Without them our economy would stagnate and the economic aspirations of millions of Americans would be frustrated.

In few places in America, or the world for that matter, is the entrepreneurial spirit more alive and vibrant than it is here in the Silicon Valley. The spinoff of new companies from old companies and the creation of new industries and firms clearly sets the Silicon Valley apart from most other regions.

The Joint Economic Committee is particularly interested in knowing more about the entrepreneurial climate in California's Silicon Valley and the factors that contribute to the startup process. Why is the Silicon Valley such a fertile ground for this type of entrepreneurial activity? How does government affect—positively and negatively—the entrepreneurial process? What can the Federal, State, and local governments do to encourage innovation and improve the Nation's entrepreneurial climate? Questions such as these are the topic of today's first hearing on entrepreneurial startup activity and public policy.

We are very fortunate to have expert testimony on this subject from a panel of successful entrepreneurs who have gone through the startup process. They know what it takes to launch a company and to successfully nurture that company through its various growth stages. And the lessons they have to tell us about what constitutes a favorable climate for entrepreneurship and innovation will be valuable to this committee, to other Members of Congress, and to the public.

We look forward to your testimony. And before I invite your testimony I would just ask if Congressman MacKay from Florida has any statement to make this morning.

Representative **MacKay**. Congressman, I'm very pleased to have an opportunity to be part of this. Yesterday's hearing was excellent, and I've just been reviewing the testimony today. And I look forward very much to the testimony and the question-and-answer session.

Representative **Lungren**. Our host Congressman, Ed Zschau.

Representative **Zschau**. Congressman, I have had the opportunity to be on the other side of the dais and on many occasions, first as a private citizen in hearings like this and then later in the Congress. But I don't think that I have ever seen 2 days of hearings on the subject of entrepreneurship, innovation, and venture capital that have as much substance and have testimony from such distinguished witnesses.

I want to commend you, Congressman, and the staff who put this together. I think you've made a great contribution to the record on this subject.

Representative **Lungren**. Thank you very much.

We are pleased with the quality of the witnesses that we've had, and look forward to hearing from all of them. At this time I would ask Mr. James Treybig, the president of Tandem Computers, to proceed as he may wish.

I would just like to tell all four of our witnesses that the prepared statements, if you've given them to us, will be made a part of the record. So you can use them or excerpts or proceed in any way you wish. We would just ask if perhaps we could have the statements around 10 minutes and then that would allow us to get involved in a question-and-answer period with you. Mr. Treybig.

PANEL 1. ENTREPRENEURIAL STARTUP ACTIVITY AND PUBLIC POLICY

STATEMENT OF JAMES G. TREYBIG, PRESIDENT, TANDEM COMPUTERS, CUPERTINO, CA

Mr. **Treybig**. Thank you.

I'm the president of Tandem Computers, and I started Tandem maybe at a different point in time, which was 1974, when there was no venture capital. In fact, there was only $10 million that year. And that's quite different, of course, than today.

And I also was a venture capitalist before starting Tandem Computers, which is a one-half billion dollar company today. And so the way I look at things may be a little different.

But I'd like to start by saying that the information that we provided to you all left out the importance of venture capital and venture capital formation, which I think is critical. The most important thing the Government can do is the thing it has done: To create an environment for venture capital to be created and be invested.

The year we started, again, there was $10 million that year invested in new startups. And today you could guess whether its $1 billion or $1.3 billion. It's a huge difference. And the difference has to do with capital gains. And, when the Government changed the capital gains law, it tremendously increased investment in new companies for two reasons, I believe.

One is, of course, the return to venture capitalists was in effect raised because of the lowering of the capital gain. But the process of lowering the capital gains tax also, I think, helped the stock market. So you get a twofold impact on the return, not only to the venture capitalists but also to the people that start companies. And that's equally important.

And I'm, of course, not talking just about the founders but, as an example, at Tandem every employee is a shareholder. So it benefits everybody and, of course, helps the company create new products, successful products, and grow.

So I think we've made a lot of progress in the country in terms of venture capital formation and we shouldn't do anything that goes back to where we were before. Now, given that there's venture capital, which wasn't true when we started, I think that today there are lots of startups. Some people would say there are too many. I wouldn't agree with that, even though some of them compete against Tandem.

But there is a lot of money for people who have ideas to start companies. And so we would represent that the more important thing today is to have startups that are successful. And there are some challenges for companies as they grow past $10 million into the $100 million, and it's actually these companies in a way—the startups that are successful—that create jobs and pay the taxes.

So at a company like Tandem, we feel that what the Government needs to do is to be sure the environment for the companies, once they get started, helps them continue to be successful, because in a way they're the role model for new startups. And the environment in Silicon Valley, the fact that a person will leave a large company and be president of a four-person company, is what makes it happen.

So it's not only the money but it's the fact that there's this hope and that you can be proud of being president of a four-people company as much as being proud of a 2,000-people company. So you must have successful startups to create jobs.

And there are challenges for companies like Tandem or other companies that have been successful. And specifically, as you go through our testimony, a lot of it has to do with stock options. Stock options and the Government's policy on stock options—it's almost impossible for me to understand. I mean, I honestly can't ever understand ISO's and all these different things.

So we must be able to attract and keep outstanding people. That is, to create a role model for other startups. And the changes in the stock options for junior stock or ISO's are a real problem for us to attract new people and be successful and create technology and other product ideas that actually leave Tandem and go to become a startup.

So I think you'll find that that is one thing in our testimony that we think is critical. And the second one has to do with R&D tax credit. And we think that was a right thing because it's growth that's important. I mean, for companies that are going to grow and survive and be successful and be role models, we feel the R&D tax credit was a valuable concept and it's one that should not be allowed to expire at the end of 1985. Thank you.

Representative LUNGREN. Thank you very much.

Next we will be privileged to hear from Sandra Kurtzig, president and chief executive officer of ASK Computer Systems.

STATEMENT OF SANDRA KURTZIG, CHAIRMAN AND CHIEF EXECUTIVE OFFICER, ASK COMPUTER SYSTEMS, INC., LOS ALTOS, CA

Ms. KURTZIG. Congressman Lungren and very distinguished committee, actually it's my pleasure to be invited and I appreciate the invitation to present my views on public policy and the entrepreneurial climate in the Silicon Valley.

What I would like to do is first describe ASK Computer Systems, because it probably isn't a household name in Congress. And second I would like to describe what I think makes up the entrepreneurial climate in Silicon Valley, or in any high growth company. And third I'd like to talk a little about what I feel are the major public policies that could aid us, these high growth companies.

As background data, I am the chief executive officer and chairman of ASK Computer Systems. I'd like to correct the record, I'm not the president anymore, I'm chairman.

ASK is a company which develops and markets manufacturing and financial management information systems software for manufacturing companies. We work with both large and small manufacturing companies, so the spectrum includes General Motors and Hughes to Daisy and Convergent Technology and some of the other companies that you're hearing today.

ASK is a publicly held company which I started about 12 years ago with $2,000 in the second bedroom of my apartment. ASK was not venture capital financed. In fact, besides there not being venture capital 12 years ago, I didn't know what it was even if there was any. And the venture capitalists definitely would not finance a software company.

I mean, this is an intangible tape that costs $10 and you sell for $100,000. So they just weren't financing software companies even if there was venture capital money. So we grew entirely from retained earnings until our initial public offering 3 years ago.

Today we have a public market value of over $225 million. I don't know what the price is today on the market, but it's somewhere like that. Over the last 5 years, ASK's compounded revenue growth has been 67 percent and our earnings growth has tracked just about that same rate of growth.

As a member of the American Business Conference and also as a past member of the executive committee of the American Electronics Association Board of Directors, I think that most of my comments will reflect the thinking of these two organizations as well as [illegible] own feelings.

In analyzing the entrepreneurial high growth companies, I think you have to look at a combination of three characteristics: Strategy, organization, and company leadership. The strategy for most of our companies is to achieve a distinctive position in a niche market through continually producing innovative products. Our big asset that we have is the ability to continue to innovate new products. We're not quite as clever in the manufacturing process, although I hope someday we will get more productive in that area as well.

We price our products based on value rather than manufacturing cost. Although not all Silicon Valley companies value price, I think most do. However, the operative word is really quality. The overall strategy is to provide a quality product.

Organization in a high growth company is people oriented. The company functions as a family. It takes care of employees who perform, but nonperformers are unwelcome and unwanted. And we're fortunate that we don't have labor unions in Silicon Valley because of the orientation toward people.

By the way, I'm commenting more on the environment within the companies because I think you're going to hear from most of us the same things: R&D tax credit, capital resources, international trade, and so forth. So I thought I'd focus a little more on the climate.

The people orientation is reflected by a corporate culture that stresses less bureaucracy and more experimentation. Information does not flow through the traditional rigid channels. At ASK an open door policy, informal atmosphere, and a high degree of management by walking around—I think, MBWA was sort of coined by Hewlett-Packard—encourages creativity and communication.

The informal dress code provides few clues to an individual's position in the organization. The underlying assumption is that good ideas can come from anyone. All employees are encouraged to share ideas. Their participation is enhanced by events such as company picnics, parties, and the weekly beer blasts, which have sort of become known by some of the Silicon Valley companies here.

The atmosphere is collegial where all ideas are debated and the best ideas emerge. The result is a true team effort. The people orientation also goes beyond the tangibles. Employees act like owners because, as Jimmy stated, they are owners.

Stock purchase and stock option plans, as well as cash incentive bonuses, create a high degree of motivation among employees. Sales reps are generally commissioned and all employees participated in cash profit sharing. In our case we balance stock options and a stock purchase that our employees have with a cash profit sharing, so the employees get immediate remuneration if we do well. The stock market sometimes is a crap shoot and you sort of have to wait until they decide if stocks should go up.

But in our case all employees get about 8 to 9 percent per year of their salary in a cash profit sharing, depending on our profits.

Customer relations are also very people oriented. The focus is on solving problems by being attentive to customer needs and interests. The phrase "customer-driven" that is often used to describe Silicon Valley companies simply means that customer input is invited as often as possible.

At ASK we do this by sponsoring conferences where customers and prospects tell us what new product features they would like developed. We also keep our R&D people in close contact with customers.

Leadership is the third characteristic of a high growth company. In any high growth environment you would usually find a high energy founder with the ability to communicate his or her original vision. This translates into a set of shared goals and values that are adopted by all personnel.

The founder's personality and management style are as much a part of the company's success as its strategy and organization.

In analyzing the characteristics I've described, I think you'll find that actually they're common with most high growth companies in the United States, not just high tech companies. This was one of the areas that you questioned in your series of questions.

I think that this can be confirmed by a report entitled "The Winning Performance of Midsized Growth Companies" that was done by McKinsey & Co. in 1983. And it was commissioned by the American Business Conference, which—if you're not familiar with it—is a coalition of 100 CEO's who run midsized high growth companies throughout the United States.

Member companies have sales between $25 million and $1 billion, and at least 15 percent annual growth rate in sales or profits for a 5-year period. However, most of the represented companies have growth rates substantially higher than 15 percent.

I think the attention paid to Silicon Valley has to do more with, you know, the high growth, the high technology, the companies all in one geographical area, and the unique environment of warm climate and proximity to major universities encourages growth.

I'm going to just sort of skip through quickly—as I know there's a time restraint—on four areas that I think public policy can be focused on. One, which I think Jimmy very appropriately pointed out, was the R&D tax credit. Extension of the R&D tax credit that is now due to expire in 1985 is crucial if our high technology companies are to remain competitive both at home and abroad.

My statement sort of goes into a little bit about the R&D tax credit, and I think that there are two comments that I would like to add to what Jimmy mentioned. One is that there is also a question about software qualifying for the R&D tax credit, and this is, of course, a major concern of ASK, being a software company; but I think it is a major concern of all companies.

You know, most of the high tech companies that are developing hardware technology, about 50 percent of their R&D—and maybe even more—is focused on software. So, although you may think they're developing hardware, the software in most cases is the unique thing that separates the different companies that you'll see in Silicon Valley.

And so clarifying the definition of qualifying R&D to make sure it applies to the development of computer software is very important. And, of course, coupled with that is making it permanent. Just clarifying it without making it permanent doesn't have much meaning there.

I think you'll find that in general, although we may get a tax credit, because we're growing so fast, we're hiring a lot of people and actually the Government is not losing money because it's making up the difference in the payroll taxes that the employees and the companies are paying.

So it's not quite a wash, but for the companies that are growing faster it's almost a wash because most of the R&D tax credit is applied to the increase in salaries. And in our case about 85 percent of our expenditures in R&D are in salaries.

And the second area is capital resources, which is very important. The major problem is the large Federal deficit. That, you know, just has to be contained. I think that probably is the No. 1 problem that most of the Silicon Valley companies are concerned about.

But the second area is the cost of capital: The higher cost of labor and capital compared to our competitors. For example, U.S. manufacturers pay about double the labor cost that's paid by the Japanese counterpart. And similarly, the cost of capital in the United States is about two to three times greater than the cost of capital in Japan.

One solution to the cost-of-capital problem would be to lower capital gains taxes, and a second would be to make corporate dividends tax deductible, thereby eliminating the current double taxation on dividends. Basic industries would benefit from the dividend deductibility and high tech companies, which generally don't pay dividends, would benefit from the lower capital gains taxes. This would go a long way toward neutralizing Japan's current advantages.

And George Hatsopoulos of Thermo Electric has done a whole study which you may be familiar with on the cost-of-capital question. And that would be available from George or I could get a copy if you would like to see the whole analysis of this cost-of-capital question. You're probably familiar with it.

The third thing which is very important is incentive stock options. These I think Jimmy, again, very aptly articulated our need for the incentive stock options. And there are a couple of things Congress can do to simplify and improve incentive stock options. One is to delete—or at least at the minimum, increase—the $100,000 annual limit. The second is to delete the sequencing requirement. And the third area is to remove the incentive stock options from the alternative minimum tax, which was another complexity added recently to this incentive stock options.

The fourth area, which is equally important in the Silicon Valley, is the commitment to science education here. We have a growing shortage of engineers, technicians, and computer scientists. And the shortage is in turn caused by a shortage of college faculty who can train engineers and scientists.

The United States needs about 1,000 new engineering faculty each year, but we produce only about 450. And at present, there is no substantial Federal program designed to deal with the engineering faculty shortage.

There are at least three things that I think Congress can do to help end the engineering faculty shortage. One is to provide a tax incentive for company cash grants to universities for faculty salary augmentation and graduate fellowships. The second area is to provide incentives for corporate donations of equipment, courseware, and associated services to teach engineering. And the third area is to allow foreign nationals who possess skills in critical short supply to remain and work in the United States.

And those are the four areas I really appreciate your allowing me to testify to today.

[The prepared statement of Ms. Kurtzig follows:]

PREPARED STATEMENT OF SANDRA KURTZIG

Chairman Lungren and distinguished members of the Joint Economic Committee:

I am honored by your invitation to present my views on public policy and the entrepreneurial climate in Silicon Valley. I will first give you a brief description of ASK Computer Systems. Next I'll highlight the general characteristics of the typical entrepreneurial company. Finally, I will discuss what public policies are needed to continue to inspire innovative, high-growth companies.

As background data, I am the chief executive officer and chairman of ASK Computer Systems, a company which develops and markets manufacturing and financial management information system software for manufacturing companies. ASK is a publicly held company which I started with $2000 in the second bedroom of my apartment about 10 years ago. ASK was not venture capital financed. We grew entirely from retained earnings until our initial public offering three years ago. Today we have a public market value of over $225,000,000. Over the last five years, ASK's compounded revenue growth rate has been 67%.

As a member of the American Business Conference and a past member of the Executive Committee of the American Electronics Association Board of Directors, I think my comments will reflect, for the most part, the thinking of these two organizations, as well as my own.

In analyzing entrepreneurial, high-growth companies, you have to look at a combination of three characteristics: strategy, organization and leadership. The strategy of most of our companies is to achieve a distinctive position in a niche market through continually producing innovative products: We price our products based on value rather than manufacturing cost. Although not all Silicon Valley companies value price, most do. However, the operative word is quality. The overall strategy is to provide a quality product.

Organization in a high-growth company is people-oriented. The company functions as a family. It takes care of employees who perform, but non-performers are unwelcome and unwanted.

The people-orientation is reflected by a corporate culture that stresses less bureaucracy and more experimentation. Information does not flow through the traditional rigid channels. At ASK, an open door policy, informal atmosphere, and a high degree of management by walking around encourage creativity and communication. The informal dress code provides few clues to an individual's position in the organization.

The underlying assumption is that a good idea can come from anyone. All employees are encouraged to share ideas. Their participation is enhanced by events such as company picnics, parties and weekly beer blasts. The atmosphere is collegial where all ideas are debated and the best ideas emerge. The result is a true team effort.

The people-orientation goes beyond intangibles. Employees act like owners because they are owners. Stock purchase and stock option plans, as well as cash incentive bonuses create a high degree of motivation. Sales reps are commissioned and all employees participate in cash profit-sharing.

Customer relations are also people-oriented. The focus is on solving customer problems by being attentive to customer needs and interests. The phrase "customer-driven" that is often used to describe Silicon Valley companies simply means that customer input is invited as often as possible. At ASK, we do this by sponsoring conferences where customers and prospects tell us what new product features they would like developed. We also keep our R&D people in close contact with customers.

Leadership is the third characteristic of a high-growth company. In any high-growth environment, you will usually find a hih-energy founder with the ability to communicate his or her original vision. This translates into a set of shared goals and values that are adopted by all personnel. The founder's personality and management style are as much a part of the company's success as its strategy or organization.

In analyzing the characteristics I've just described, I think you will find that they're common to most high-growth companies in the United States...not just high-tech companies in Silicon Valley. This was confirmed by a report entitled "The Winning Performance of Midsized Growth Companies" done by McKinsey and Company in 1983. It was commissioned by the American Business Conference, a coalition of 100 CEOs who run midsized high-growth companies throughout the United States. Member companies have sales between $25 million and $1 billion, and at least a 15% annual growth rate in sales or profits for a five year period. Although most of the represented companies have growth rates substantially higher than 15%.

The attention paid to Silicon Valley probably has to do with the number of high growth, high technology companies all in one geographical area. Its unique environment, the warm climate and proximity to major universities, encourage the many high-growth companies to locate here.

As to public policies, high-growth, high tech companies are not looking to government for protection of products or market niches. We know that our success or failure depends on our own ability to keep products innovative and to attract and motivate good employees. However, there are at least four areas in which government policies can help create an environment in which we can flourish: tax credits, international competitiveness and capital resources, employee incentives, and education.

(1) R&D Tax Credit

Extension of the R&D tax credit now due to expire in 1985 is crucial if American high-tech companies are to remain competitive both at home and abroad. Loss of the credit would particularly impair our ability to compete in international markets.

The R&D credit, which was created in 1981, has been very successful in motivating high-tech companies to increase their research budgets. In addition, an important side-effect has been the creation of many new jobs. This has allowed the government to recoup revenues lost through the credit in the form of increased income and payroll taxes.

For example, at ASK, our R&D expenditures have increased at a compunded rate of 93% over the past five years while we've had a compounded revenue growth rate of 67% and a compounded net income growth rate of 58%. About 85% of our R&D expenditures are in salaries, benefits and related employee expenditures. As a result, most of the savings we've realized from the R&D tax credit have been paid out in the form of increased payroll taxes.

Also, the IRS has proposed rules that would effectively exclude software development from the R&D tax credit. This would undermine much of the purpose of the credit and is contrary to Congressional intent.

Congress can do two things to encourage continued research and development in the private sector: (1) extend the tax credit and make it permanent; and (2) clarify the definition of qualifying R&D to make sure it applies to development of computer software.

(2) International Competitiveness and Capital Resources

Declining international competitiveness is the major problem facing American industry today. Our deteriorating position can be attributed to several complex factors including large federal deficits, an overvalued dollar, severe export restrictions, inability to access foreign markets, and especially, higher costs of labor and capital compared to our competitors. For example, U.S. manufacturers pay about double the labor costs paid by their Japanese counterparts. Similarly, the cost of capital in the U.S. is about two to three times greater than the cost of capital in Japan.

One solution to the cost of capital problem would be to lower capital gains taxes and make corporate dividends tax deductible thereby eliminating the current double taxation on dividends. Basic industries would benefit from dividend deductability and high-tech companies would benefit from lower capital gains taxes. This could go a long way toward neutralizing Japan's current advantage.

International competitiveness of American high-tech companies can also be fostered by abandoning domestic content legislation in favor of efforts to open foreign markets to U.S. products. One way to accomplish this is to eliminate U.S. tariffs on high tech products in order to force reciprocal actions abroad.

Congress can do two things to make American high-tech companies competitive in the international market: (1) reduce capital gains taxes and make dividends tax deductible; and (2) oppose domestic content protectionism and mandate vigorous efforts to open foreign markets to U.S. products.

(3) Incentive Stock Options

Incentive stock options allow smaller companies with high-growth potential to compete with larger companies in recruiting top-level scientists and engineers. Young entrepreneurial companies can't afford to pay these employees their full value in cash, so stock options provide a way to make up the difference.

Unfortunately, the incentive stock option currently contains two severe restrictions: Options are limited to $100,000 per employee per year; and options must be exercised in the order granted. In addition, since 1982, they have been further complicated by inclusion in the Alternative Minimum Tax.

Congress can do three things to simplify and improve the incentive stock option: (1) delete or increase the $100,000 annual limit; (2) delete the sequencing requirement; and (3) remove incentive stock options from the Alternative Minimum Tax.

(4) Commitment to Science Education

The most serious constraint on the growth of U.S. high technology industries today is a growing shortage of engineers, technicians and computer scientists. This shortage is in turn caused by a shortage of college faculty who can train engineers and scientists. The U.S. needs 1,000 new engineering faculty each year, but produces only about 450. At present, there is no substantial Federal program designed to deal with the engineering faculty shortage.

Congress can do three things to help relieve the engineering faculty shortage: (1) provide a tax incentive for company cash grants to universities for faculty salary augmentation and graduate fellowships; (2) provide incentives for corporate donations of equipment, courseware and associated services to teach engineering; and (3) allow foreign nationals who possess skills in critical short supply to remain and work in the U.S.

Representative **Lungren**. Well, thank you very much.

Next we will hear from Mr. Aryeh Finegold, president of Daisy Systems Corp.

STATEMENT OF ARYEH FINEGOLD, PRESIDENT, DAISY SYSTEMS CORP., SUNNYVALE, CA

Mr. **Finegold**. Good morning.

As mentioned, Daisy probably is not a household word so I'll give you a quick background of Daisy as a company. Daisy is in the business of increasing the electronic design engineer's productivity. We founded Daisy in August 1980, and we shipped our first product out of manufacturing in February 1982, and we have been profitable ever since.

Our sales grew from about $7 million in calendar 1982 to about $28 million in calendar 1983, and analysts expect us to ship over $85 million in calendar 1984. You have asked how do I explain the strong entrepreneurial climate in the Silicon Valley. And I think the most important part of it is technology.

Again, I can only judge from my own experience. Both Dave Stem, who was the cofounder of the company, and myself were engineering managers at Intel Corp., who was the leader in their own technology, in the semiconductor technology. Being in that company, we were aware of the needs that design engineers in other companies would have 3 or 4 years down the road. Being in a high tech environment, we were exposed to the technology that enabled us to solve the problem and create a whole new marketplace, which analysts estimate would be $2 billion, 4 years down the road. And that's a market that didn't exist before at all.

When dealing with startup activity and public policy, I believe we should focus not on the zero to $10 million companies, but the companies who are $50 million and above struggling to be $250 million. And again, I'm judging off my own experience.

To build Daisy to $100 million we needed no help, it was working like a charm. Inside the Silicon Valley you have today the right climate to make a $50 million company because basically venture capital is available, technology is available. And the most important thing, and I couldn't emphasize it more, is the thing that makes this whole thing happen: The employees are owners of the company; they have the stock options.

For the zero to $10 million or the zero to $50 million companies, providing they grow fast, then the initial stock option is very clean. Because basically there is zero value to the company when you start, you buy those stocks for a penny a share and you own them and there's no IOS limitation or anything associated with it.

But to take Daisy from $100 million company to a Fortune 500, which we are committed to do, we really need your help. And we need your help in three areas. We need your help in R&D, we need your help in our ability to hire and retain employees, and we need your help regarding exports. And I would like to spell it out.

We have to, again, understand that when Daisy created the first work station to increase productivity of design engineers we have created the whole $2 billion market opportunity, and it's probably going to grow bigger than that. Today there are 10 other U.S.-based companies competing with Daisy in the CAD business. And all power to them, but the issue is: How long is the United States going to remain the only player in that game and what can you do to help us to stay the only player in the game?

And, again, to emphasize the meaning of R&D, at Daisy we have more programmers than the rest of our competitors put together, we have 250 programmers. We'll probably be spending $15 million this calendar year on research and development. About 50 cents of every dollar spent in R&D in the CAD business was spent by Daisy. But at the same time we're not complaining about it because 66 percent of every dollar made in the business was made by Daisy.

So you see in the high tech business there is a clear correlation: R&D brings you the new products and the ability to get high margins. And Daisy has been for the last 2 years enjoying 75 percent gross margins. Those margins and our ability to make profits give us the ability to reinvest in R&D. And we're investing about 17 percent in R&D.

This is all nice when it's done within the framework of the United States and that helps us to maintain our position vis-a-vis the other 10 companies that are United States based. The thing that I'm afraid of, and it's very clear to all of us, is that the Japanese and the Europeans have yet to leave us one—the moment it becomes very clear, and it is becoming clear now that this is for real, a $2 billion opportunity, they would move in with government programs behind it, with government money into R&D.

And we have to bear in mind that R&D is a very high risk investment. When you go out like we did, some programs break out technology, and that's where you make the big profit and that's where you make those $2 billion market opportunities. But at the same time some of them fail, some of them won't yield.

And by giving us the R&D tax credit you enable us to, what in the paratroopers we called, attack in wider front. When you attack in wider front you have higher chances of winning. Because you'll find that technology is like anything else, you have to find the crack; you've got to break through it and get to the other side of it.

And if you would enable me to attack in wider front, me and the rest of my competitors and in the relating industries, we will find where the crack is and where we can go to another order of magnitude.

I was asking also for your help to be able to hire and retain employees. This business is very technology-driven, R&D-driven. We need to be able to get more and more qualified people. Unfortunately—and that's a whole separate issue to talk about—there are not enough of them in the United States.

And if you look at companies like the company I came from, Intel, they basically get most of their R&D junior guys, they're coming from students who came from overseas to the United States. If the portion of the immigration bill that relates to forcing students to go back to the countries they came from would pass, I predict—and I wonder how my colleagues feel about it—that it would be worse than a major earthquake in the Silicon Valley.

You'll have companies like Intel and Daisy and probably others here shut down because they won't be able to—well, I got to be careful; they'll either shut down or they'll move overseas or some other things because they won't be able to get the manpower they need.

And the one thing I think the Congress ought to be aware of: In my opinion, the greatest thing in the United States is not the oil in Texas or the gold in the Sierras; the major natural resource we have is the ability of this great country year after year to get the cream of the crop from Europe, from Japan, from Asia, from every other place. And by telling those very talented people to go back to where you came from you may be doing some harm—I don't know what the idea is behind it, but I believe we're losing more. It would be equivalent to telling the oil in Texas to go back down to Earth, and those kind of things.

So this would be a major setback to the high technology companies. In terms of being able to retain employees, I'd like to point out again that for the small startup it's a nonissue. But for companies who already proved to you that they're successful companies, that they have all the elements that Sandra talked about, now you want to enable them to go the one step forward.

And the way the incentive stock option is structured today it basically drives the employee to get rid of his shares the moment he can exercise them. And at that point—and we've seen it, we've seen the impact on people at Tandem, at Intel, at other places—it basically makes them lose interest in the company they're working in.

Because the way the tax structure is today, if they want to avoid specifically the alternative minimum tax, what you're doing is you make them sell immediately and at that point they don't care that much about Daisy or the other companies where they are working. They are no longer what we refer to as owners of the company.

The last issue I want to talk about is exports. I think it's very, very clear to me—and it should be clear to the Congress and to the Government—that we have to export. If we want to maintain leadership in any given technology we have to look outside at the big market out there. And if we don't establish leadership overseas we leave those areas for them to build their own technology in their own private market and then come back and take the business away from us like they did in sectors of the semiconductors and others.

And it was very clear to Daisy when we started because the first salesman we hired we put in the bay area. The second salesman we hired—and today he is the vice president of European sales—but the second salesman we put in England. And I want to make it very clear that Daisy could have easily built a $100 million company by selling just in Silicon Valley. I could give all my sales people bicycles and I could build a $100 million company.

But the issue is that I'm giving away the rest of the market overseas and eventually 3 years down the road they'll come back here and take the Silicon Valley business away from me as well. So that was very clear to Daisy and we went overseas.

We were lucky that the Japanese and European companies didn't realize the potential in the CAD market. It's hard for them now not to realize that because now it's documented, it's a $2 billion market opportunity. But had we had any Japanese or European competitor at the early stage they would have wiped us out.

Because any time we get an order from overseas you go to—it's basically a guessing game when and if you'll be able to ship. And I'd like to put on the record our thanks to Ed Zschau for helping us when we one time ran into a real dead end. He helped us finding "Who do we talk to and what do you do?"

But it's a sad fact that we have to resort to calling our Congressman to get something done to be able to ship to—and we're not talking about Red China or some little flaky company on the border of Finland or right by the Russian consulate, we're talking about exporting to British Telecom and British Aerospace. And if they are selling to the Russians we have a problem there.

So we also as a startup—and this is the one area, by the way, that you can help also the zero to $10 million company. The export license is something that is totally unpredictable and is very, very expensive to process and it leaves our potential competitors with a big advantage. They can quote delivery dates, they can deliver immediately.

And when you're in the business of increasing productivity of design engineers it's hard to tell them "we'll increase your productivity some time in the future when somebody in Washington would get around to it." So we really need help in those three areas if you want to help us get a $100 million company to a Fortune 500. Thank you.

Representative LUNGREN. Thank you very much.

Next we'll hear from Mr. Arthur Lasch, Jr., president and chief executive officer of CAE Technology.

STATEMENT OF ARTHUR LASCH, JR., PRESIDENT AND CHIEF EXECUTIVE OFFICER, CAE TECHNOLOGY, INC., MOUNTAIN VIEW, CA

Mr. LASCH. Thank you. Congressman and members of this distinguished committee, I guess there is really a consensus and we haven't really discussed this amongst ourselves.

Just to identify who I am, I'm the president and CEO of a new company that's involved in inspection of security printing—that's money. But in some of my past lives I've been the president of a robotics company and several companies that manufacture capital goods for the semiconductor industry. I am a director of a number of companies and I'm also a director of the American Electronic Association.

I've been sort of an entrepreneur for 25 years and I've started a number of companies. One with one of the gentlemen that's sitting over there in the venture capital group. I believe that if the United States is going to have an industrial policy it ought to be one that targets creating an environment for entrepreneurs.

And I think that the major items that provide this environment are incentives to risk-takers, dynamic domestic and foreign markets, a very strong commitment to basic research, and an adequate supply of trained technical people. Obviously, this perception is not mine alone and I think that's the general consensus of the people sitting here.

To take those areas one at a time, incentives to risk-takers; there are really three kinds of risk-takers in startup businesses. There's the entrepreneur or the team of entrepreneurs that risk their futures to create a new business. And the second type of risk-taker is the financial risk-taker who provides the risk capital to fuel this new venture. And the third class of people are the employees who risk stable jobs to become involved in a new venture.

The entrepreneurs and the venture people can realize their rewards for these risks by simply owning shares and subsequently, if the venture is successful, they can sell these shares through our free market system, which I don't think anybody here has touched on. But that is, to my way of thinking, fundamental to the whole process.

If there were not a market for the end result of the ownership interest, there is really no reason to have an entrepreneurial environment. And I think this is very clear if you look at some of our trading partners, Japan specifically. They do not have an over-the-counter market with easy access, and consequently you don't have very many small growth companies in Japan.

The third class of people, the people who risk their stability to become employees of new ventures are usually rewarded through ISO's. And currently the tax situation in the United States really penalizes those people because they are taxed on what is really an unrealized capital gain.

In fact, it forces them to realize it and therefore destroys their interest in the company. I think that's really deplorable.

The second item, which is dynamic domestic and foreign markets, I think first of all we need ease of capital formation. And given that, we need very little competition from the Federal Government in those capital markets. And, of course, we are experiencing that right now. This has a tendency to drive the interest rates up; it strengthens the dollar in overseas markets, and increases imports and decreases exports because our companies are no longer competitive in the foreign markets.

And this, of course, feeds back into the system causing loss of jobs and increase in social costs. And it's a positive feedback loop.

I think reasonable goals for the Federal Government would be to have a balanced budget, a cap on spending as a percentage of the GNP, and even line item veto power for the President. I think a move toward that kind of fiscal responsibility by the Federal Government would stimulate the markets tremendously.

I can only second what everyone here has been saying about the difficulty in East-West trade because of the licensing requirements. It's one of the hallmarks of a new high technology startup company that they enter into the foreign markets very early. And the bureaucratic process to get licenses is just overwhelming in some cases. So when a company is faced with many problems during its startup phase that's one that they really don't need.

Third, a strong commitment to basic research. Basic research is really the main ingredient in innovation in companies. And I think that's one area that the Government has done a fairly decent job in the R&D tax credit. But also that is getting ready to expire as a sunset in 1985 and I think that that should be made permanent.

Tax preferences for R&D expenditures, whether they're for basic research commissioned in university laboratories or whether it's done internally in companies, I think that's an excellent way for the Federal Government to stimulate R&D and still let the free market forces direct the priorities.

An adequate supply of trained technical people, this is a problem that's been festering away for the last 25 years. And it's exacerbated to some extent by the fact that industry itself has recruited a lot of academic people that would normally have become teachers through high salaries.

I think incentives can be devised that will establish a better situation there. Just as a case in point, when I was running Machine Intelligence, a robotic company, we found that one of the principal barriers to entry in any of the smokestack industries was the total lack of infrastructure—technical infrastructure—in those companies that would allow them to utilize these new technologies, and there's no place to get the people.

So it's a very serious problem. It may be the one limiting factor in the technological growth in the United States through the near future.

Again, I recommend a Federal industrial policy that targets creating an environment for innovation and entrepreneurship consisting of differentiating the degree of investment risk in the tax structure, Federal fiscal responsibility to create dynamic domestic and foreign markets with capital for expansion, and strong free market approach through tax preferences to promote basic research, and a coordinated approach to enhance the supply of training technical people. And I think that American industry, given that kind of environment and tools will respond as they always have, which is very well. Thank you.

[The prepared statement of Mr. Lasch follows:]

PREPARED STATEMENT OF ARTHUR LASCH, JR.

Mr. Chairman, Members of this distinguished Committee:

My name is Art Lasch. I am President and Chief Executive Officer of CAE Technology, Incorporated, a new company involved in high speed visual inspection of security printing. During the past 25 years I have started or participated in starting a number of high technology companies. I currently serve as a Director for several companies and I am a Director of the American Electronics Association.

Mr. Chairman, I sincerely appreciate the opportunity to appear before you in this very important hearing and I hope my entrepreneurial experience during the past 25 years can be of assistance to this committee. This experience runs the gamut from utilizing Small Business Investment Corporation (SBIC) funds and Small Business Administration (SBA) loans in forming a start-up company to using private venture capital funds and R & D partnerships to spin off a company whose technology was developed by utilizing grants from the National Science Foundation (NSF).

First and foremost, I believe that if the United States is to have an industrial policy it should be one which creates an environment in which entrepreneurism with its subsequent growth in jobs, exports and technology can flourish. This environment has many nuances but the central issues, at least in the high technology area, consist of the following:

- Incentives for risk takers;
- Dynamic domestic and foreign markets;
- A strong commitment to basic research;
- An adequate supply of trained technical people.

Perception of this as a healthy environment for growth is certainly not mine alone but is espoused by numerous organizations and individuals who have closely studied the problem. But let me be more specific.

First, incentives for risk takers, in an entrepreneurial environment the risk takers can be separated into three groups. The entrepreneurs, these individuals either alone or acting as a group risk their future in order to create a new business. The financial risk takers who provide the capital required for these entrepreneurs. And last but not least, the employees of these high risk ventures.

The first and the last of these groups can have their personal risks rewarded through the ability to acquire ownership in their ventures by purchases of stock or incentive stock options, but this should be without the current burden of taxation on unrealized gains. All three groups can then reap the rewards of their high risk endeavors through preferential taxation of capital gains.

The final factor in this equation is the free market for the securities of these high risk companies. No changes seem to be needed in this area at this time, but a policy for an entrepreneurial environment must protect this free market.

Second, dynamic domestic and foreign markets, a healthy economic environment in my estimation would involve ease of capital formation and little, if any, competition between the Federal government and industry for capital. Traditionally this competition causes interest rates to be high, strengthens the dollar in foreign markets and makes American goods less competitive in foreign trade. I think reasonable goals for the Federal government would be a balanced budget, a cap on Federal spending as a percentage of the gross national product and a line item veto power for the President of the United States. This return to fiscal responsibility by the Federal government, I believe, would create a substantially better environment for American industry both at home and abroad. As a further point in the area of foreign markets, new high technology companies tend to enter international markets early in their life. One of the major impediments to this entry arises from the burdensome and time consuming licensing and trade restrictions in West-West trade.

Third, a strong commitment to basic research, basic research is the main ingredient in innovation. It allows us to create new industries with new technologies and without it our productivity, and position as the world leader in technology will deteriorate. I think the Federal government can create a environment through a series of carefully structured tax preferences such as the R & D tax credit, which acknowledges the risks involved in this activity and rewards the companies that undertake them. Further, where very large R & D expenditures are involved some relaxation of the antitrust laws should be considered to permit cooperative programs to solve basic problems. Tax preference for R & D expenditures whether for basic research commissioned in university laboratories or within the companies themselves seems to me an excellent way for the Federal government to stimulate this effort while allowing free market forces to choose the priorities for research.

Fourth, an adequate supply of trained technical people, many factors over the past 25 years have created an environment in which technically trained people are not being produced by our educational system at the rate required by the expansion of our industry. To make matters worse, industry itself has been recruiting the services of talented technical instructors by offering higher paying jobs in industry than are available in academia. This problem is of such magnitude that it may well be the limiting factor in technological growth in the United States in the near future.

As a case in point, in a recent article in the Wall Street

Journal (1/8/84) there was a discussion of several new bills that would fund research and development for industrial technology. One bill sponsored by House Science and Technology Committee Chairman, Don Fuqua, of Florida would fund the development [illegible] Robots and Robot-like machines. A spokesman for the Robotic Industry Association despairs of ever overtaking the Japanese in the Robotic field due to the high cost of research and development. But this is a dreadful misconception since U.S. robotic technology is actually well advanced over the Japanese and, in fact, this technology was generated originally in the United States. The ingredient which is present in Japan and missing in the United States is the broad-based technical infrastructure necessary to implement the use of robots in the so called "smokestack" industries.

Proposed remedies for this problem include tax credits for contributions to universities and colleges including teaching fellowships. Other suggestions involve changes in the immigration law to allow foreign students to stay in the United States to teach after graduation and relief from the tax consequences of student loans forgiven due to service as instructors.

Again, I recommend a Federal industrial policy that targets creating an environment for innovation and entrepreneurship consisting of differentiating the degree of investment risk in the tax structure, Federal fiscal responsibility to create dynamic domestic and foreign markets with capital for expansion, a strong free market approach through tax preferences to promote basic research and a coordinated approach to enhance the supply of trained technical people.

And to do these things in a consistent long term program which will allow American industry to plan and respond to the challenge as it has always done in the past. Thank you.

Representative **Lungren**. Thank you very much.

We'll try to g[illegible] minutes apiece in questioning and see if we can keep to that so we'll all get around a couple of times.

I just find it more and more interesting all the time in some of the testimony we have. Ms. Kurtzig, you mentioned that all your employees participate in cash profit sharing, I think you said, up to 12 percent of——

Ms. **Kurtzig**. It's a percentage——

Representative **Lungren**. Pardon me.

Ms. **Kurtzig**. It's a percentage of our profits distributed among the employees based upon their base salaries. And it turns out to be about 8 percent of their base salary per year.

Representative **Lungren**. An interesting thing about that is that in hearings that this committee had on comparing our economy with that of Japan, they mentioned that in Japan, as a practice, much of an employee's compensation is based on the success of the company all the way up to 30 percent. And some people said, "What a great idea that is, but we'd never be able to transfer that to the United States."

We're finding more and more that a lot of things that we're doing here in the United States that a lot of people are not aware of is already existing as opposed to just something we might try.

There appears to be commonality of opinion on a number of different subjects and I know we can go into those. I'd like to ask all of you your comments on a question that you didn't address. And that is: What role do the universities and Government labs play in startup companies here in Silicon Valley?

You've mentioned the importance of having good university institutions nearby, but are there university laboratory policies or government laboratory policies that have either encouraged or discouraged the use of their ideas such that they might create spin-off companies? I wonder if any of you would like to talk about that.

Mr. **Lasch**. I at least have had one positive experience in which—this happened to be a private nonprofit organization, but a well-known organization in this area—in which we used their personnel and two NSF grants to investigate a new technology, which in fact ended up becoming a company that was funded by venture capital and is still in existence.

Your know, it's too early to tell whether it's going to be a success. It's had its ups and downs. But all in all there was a recipe that seemed to work, at least in that case. This happened to be a software company.

Representative **Lungren**. Anybody else?

Mr. **Treybig**. I have some comments in our notes here that often the Government regulations relating to owership of the idea is a problem when moving into the start-up environment or corporate environment. But I'm not real familiar with those myself, that came from our legal people. That there are barriers that have to do with government ownership of the ideas and the complexity of—if you try to imagine a startup of four people who don't have any income trying to get a company going, to think about the maze of Government regulations and lawyers working on how you get this idea into your little company, I think it would put it in better perspective.

Representative **Lungren**. Well, let me ask this to all four of you: We had a day of hearings on the existence of Government labs. Obviously, Government labs have a specific mission. In many cases their mission isn't basic research, it's to perform a function often in the military field.

We've had legislation to require that, to the extent they have ideas that have been developed, that they get those ideas out and make them available to the public. There's even a center for information that's been established to promote that. In our hearing it came out that the primary user of that center has been the Soviet Union. And the second most heavily utilized entity was Mitsubishi.

And I just wondered whether in fact any of you in dealing with your businesses have any dealings with the Government labs, or whether you felt that they are inappropriate, or the ideas they come out with are not particularly relevant to your experience? Or is there a lack of knowledge of even the ability to get some information?

Maybe the Soviets are doing it for military reasons, but I doubt Mitsubishi is trying to build the world's greatest tank, and I just find it kind of interesting that no one seems to know much about it.

Mr. **Treybig**. Well, I'd like to come back and answer that in a more blunt way.

Representative **Lungren**. Fine.

Mr. **Treybig**. You know, we're a half-a-billion dollar company and for us to deal with the Government costs a lot of money because of regulations on legal things. And it's almost hopeless, so we wouldn't go to the lab. But I don't want to take anything away from the lab people because I recently gave a presentation to the Army labs and they have terrific people.

Maybe the reason the Japanese and the Russians go there is they don't have to deal with the laws. You know, if I don't have any laws or any problems or regulations I'd go to the labs, too. And that's the difference. They can get it without dealing with regulations.

Mr. **Lasch**. I basically have been out of that arena for 10 or 12 years, but I think that there isn't enough publicity given to the fact that these things are available. And especially smaller companies, they probably don't even know that.

Representative **Lungren**. Well, I found that almost every Member of Congress was in the dark on this. As Mr. Finegold said, you have to go to your Congressman or Congresswoman to deal with the Government, and unfortunately that's a fact of life. And if we're not even aware of this information base it's not surprising that other companies weren't. Maybe that's something we have to do a better job of.

Congressman MacKay.

Representative **MacKay**. Well, I'd like to explore and get your response to a question that we discussed somewhat yesterday. All of you have talked about the R&D tax credit, that need to make it permanent. Yesterday there was a discussion about the fact that if it's an incremental credit you have some side effects that no one anticipated.

If we went to a flat tax or a modified flat rate tax—the rhetoric could be seen several different ways—but essentially, if we tried to dramatically broaden the tax base in order to reduce the brackets, one of the things that would happen is the ability to provide incentives would be dramatically diminished.

Mr. Finegold was talking today, and I thought it was a very interesting way to look at it, to contrast the R&D tax credit with the Japanese and European way in the sense that over here the tax credit says the Government would subsidize the man who for himself will figure out where the opportunity is; and over there the Government says, "No, we'll tell you where the opportunity is".

What's going to happen if we do away with those incentives? In other words, have we gotten ourselves so used to the idea that Government needs to subsidize something?—which is what an R&D tax credit is. If we really were going to think free market, could we reduce the rates dramatically and forget about those incentives? Did they come about, in other words, because of the tax structure?

I'd like to get your ideas on that, and I'm not trying to make any point. I'm really trying to see how you feel about that.

Mr. Treybig. Well, first I'd like to, if I could—as all entrepreneurs in the bay area—be brash and disagree with the word "subsidize."

Representative MacKay. Well, all the rest of us are paying money out of the Treasury.

Mr. Treybig. Well, let me put it in a different way. If you invested $1 million in Tandem and today you get back $100 million but it took 2 years—because we pay taxes, it's a question of when. So you call it a subsidy today, but it's a big payoff for you tomorrow.

Representative MacKay. But we also subsidize a whole bunch of people who may not ever get back anything.

Mr. Treybig. But the point is that R&D is a payback in the future. When we develop new products and we innovate new products, we create jobs in this country in businesses. So R&D is different than something else. R&D is the future of industry and business for America.

Representative MacKay. So you would see it as an investment rather than a subsidy?

Mr. Treybig. It's not a subsidy. I mean, look at the bay area. All of this money that came from lowering the capital gains taxes created huge amount of business and exports and jobs. And I might say that Tandem gives stock options to every single individual and a sabbatical every 4 years with 6 weeks of extra vacation for every single assembly worker.

So this is an investment in the future. It's R&D that creates companies. And once you think about it that way you wouldn't use the word "subsidy." I'm just picking on the word.

Representative MacKay. Well, I'm sorry I used that word. I happen to agree with it, but it happens to be a subsidy.

Mr. Treybig. Yeah, I can see how you say it. But it would be a negative word to us because we're creating jobs. And we face tremendous competitive competition overseas against huge companies who, as with Daisy, started with, I would imagine, not many millions of dollars and today they're going on $100 million and they hope to be a $1 billion company.

And then along comes a very large Japanese company that has billions of dollars to spend on R&D. So, you know, we must have the ability in America to invest in R&D. And it's what's going to make us successful and create jobs, in my opinion. And you're looking at four people here who have created a lot of jobs through a subsidy. [Laughter.]

Representative **MacKay**. Gee, that really was a bad word. Let me just suggest that what I'm asking you now is—since we all favor the R&D tax credit and we also all favor the flat tax, and there is an inconsistency there—how you're going to react when there's a surprise ending that "Behold, we can't give incentives with the flat tax"?

Mr. **Treybig**. Well, I'm for the R&D tax credit. I'd vote for that.

Ms. **Kurtzig**. I actually, being the entrepreneur as Jimmy, have to really jump on that word "subsidy" as well. I'm sorry, Representative MacKay, but I think we—that, No. 1, I don't think that—if you just pretend like it's a subsidy for a second, I think the Government ends up with more taxes from us because, No. 1, it encourages more jobs.

We're only getting the tax credit on 25 percent of the incremental growth. And most of that growth is in people's salaries. And I think in our case it's like 85 percent of our R&D budget is in salaries. So I think, No. 1, if you add the payroll taxes that our employees and our company is paying you'll find that it's close to a wash right there to the R&D tax credit.

Second, since the Silicon Valley and high growth companies in general are growing significantly faster than the general basic industry companies, we're paying increased taxes because of our high growth. In our case we're paying 45 percent tax rate. So I think that if you add our profits, which are 18 percent pretax and we end up with 10 percent after tax, the increase in the amount of taxes because of our increase in tax growth, I think you'll find that the R&D tax credit is very minor compared to the increase in taxes that we're paying.

Third, the advantage that the U.S. companies have over the Japanese is our innovation. Since our cost of capital is two to three times that of the Japanese, you know, we don't put as much money—although we should—in capital expenditures. And so we can't compete at this point—although I think this is going to change—in the manufacturing efficiencies that the Japanese have.

So instead what we have to do is continually create innovative products. And the whole asset that the high tech companies have is our ability to continually come up with creative products. Every time we come up with one, the Japanese copy it so we have to go back and create some new ones.

And I think that if we lose that tax credit—and I don't think we have time to worry about the flat tax, that's why I'm avoiding answering the question as well. Because we have an R&D tax credit right now that's going to expire in 1985. And, you know, we really need that and we just can't lose it.

And I think instead of discussing something else that might happen I think we have to discuss something that we have right now. We just can't afford to lose this tax credit.

Representative LUNGREN. Will the gentleman yield for a moment?

Representative MACKAY. Yes.

Representative LUNGREN. Maybe we can focus the question this way: We all agree, you're not going to get any disagreement here on the tax——

Representative MACKAY. I'm a friend. I want you to understand that I intend to vote to extend it.

Ms. KURTZIG. Oh, OK.

Representative LUNGREN. But what our question is, you can handle it two ways. If in reducing the capital gains tax, for instance, a number of years ago instead of reducing capital gains across the board the Congress had said, "We will reduce capital gains to the extent that one plows that back into research and development," that would be a particular type of tax credit as opposed to reducing the overall rate of the capital gains tax.

And the only question we've been trying to ferret out is: If we do move—because I do think Congress is going to move to a tax simplification in 1985—to a reduction in the rates and we move toward a narrowing of the different brackets, and that in itself reduces the importance or effectiveness of a tax credit. In other words, if we're taxing you at 50 percent and we give you a credit against that which is worth more to you than if we're taxing you at a 30-percent rate and we give you a tax credit against that.

The point that we're trying to ask is if we move to simplification will the fact that we eliminate some of these disparities of treatment because of different activities eliminate the type of incentives that you have indicated are important to the way you start up your businesses? That's a point that we're trying to get at.

In other words, can you entrepreneurs only work in the—if I may use the expression—"screwed-up" tax environment that we've created, or if we had a good tax environment presumably you could also work within that.

Ms. KURTZIG. First of all, excuse me for jumping on the word "subsidy." I think we all get nervous when——

Representative MACKAY. No; I understand.

Ms. KURTZIG. But I think clearly a more simplified tax treatment would be beneficial to us and a lower tax rate, or a zero corporate tax rate—which probably won't happen, but would be nice—would be certainly advantageous to the Silicon Valley companies.

Mr. LASCH. But I hope you're not suggesting that you do away with the difference between capital gains treatment and ordinary income.

Representative LUNGREN. No; we didn't.

Representative MACKAY. Well, there are some suggestions that that be done, since that's also a subsidy.

Mr. LASCH. You know, you'll stop the formation of capital again.

Representative MACKAY. I agree that we should have a capital gains distinction.

Mr. LASCH. I mean, many of our trading partners have no capital gains tax whatsoever. But isn't the real issue here whether or not the Government takes the funds and directs them through Government labs and grants and so forth, or whether you let the free market forces determine where the R&D dollars are spent?

I just happen to feel that a free market approach is better than having synthetic——

Representative MACKAY. I agree.

And one of the things that comes to mind to me is the Government labs, which are a very ineffective subsidy since they're doing something that nobody cares about.

Mr. LASCH. Oh, I do think that people care about it. I think that it's not well enough known.

Representative MACKAY. Well, it looks like we're subsidizing our competition more than we are our own people.

Mr. FINEGOLD. I just want to put on the record that I've been dealing with those labs and I think they're doing a very important role and they have a very clear role in defense, for example. They also have very clear roles in health services and other places. As much as I believe in the free market, there are areas where it will never make sense for us to invest in, yet the Government should invest in one. Defense is one, and curing cancer or other things of that nature we should be investing in.

But I'm kind of hearing the consensus that we really are not using, the private industry is really not using those labs. And maybe it won't be a bad idea to close officially that freedom of information, or at least wait until they put it in Moscow and then we put it on this side.

Because the industries, I'm just hearing right now, are not using it. The labs do have an important role, but let them focus on what they want to do. My gut feeling tells me it's also a hassle for the lab to maintain this openness for people who don't really care about this openness.

Representative LUNGREN. Congressman Zschau.

Representative ZSCHAU. Congressman, I'm delighted to have had this opportunity to hear from people who have created jobs. I don't get a chance in the Congress to have this kind of dialog as often as I think it's important to have. I think that this kind of dialog that you've established through these hearings should be required listening for all Representatives.

If I could just summarize briefly some of the comments and then ask a question. What I pick up is that, rather than requesting from the Government some sort of special treatment for Silicon Valley or for high technology or computer companies, essentially what these people are suggesting we do in government is to take those actions that will encourage growth, that will enable companies to attract and motivate employees, that will encourage people to take risks, that will encourage people to do research and development which provides foundation for future products and industries.

If you go down the list there is never any mention of "for Silicon Valley" or "for high technology" or "for the computer-aided design" or "software," or "fail-safe computers," or "robotics," or anything. It's for investment in the future. The R&D tax credit could be applied by companies that are in the basic industries as well as the high technology industries.

Being able to motivate employees through stock options can be applied wherever there is growth opportunity. Investing in education, contributing to education, encouraging people to contribute to universities apply across the board. And similarly, with export licensing we should be trying to encourage rather than detain exports that are ordered.

The question that I have given that background, which I feel to be refreshing and appropriate, is: Is there any reason to believe that if we did all these things that there would spring up around the country Silicon Valleys elsewhere? That is, is there something we're missing, is there something unique about this place or a few other places in the country?

Or if we in Government did all these things and maintained an environment for innovation, could we expect that the kind of activity that's occurred here could eventually occur throughout the country? And I'd be interested in the reaction or comments of any of our panelists to that kind of question. Is there something unique about this area, or if we did these things would we likely see this kind of growth activity taking place elsewhere?

Mr. LASCH. I think one of the key ingredients that's made this area what it is, and also the area in Boston, is the quality of the educational institutions. If you had to pick the one factor that was different between here and Richmond, IN, I think you'd have to pick that. And so that tells you one way to order the priorities.

Mr. TREYBIG. I might just disagree with that a little. I'd say there are a lot of good schools. There are some great schools in Chicago. And the difference, I believe, has to do with people; for instance, the venture capitalists that we have in the bay area who are innovative. For example, they're supportive of, for instance, giving options or having profit sharing for every employee. In fact, they demand it.

So the difference, one of the differences is enlightened community leaders, if you will, or investors. And I think you see this springing up in Austin, TX, as an example. There's another area where things are happening there because they're progressive and aggressive in having a good environment for companies.

So I think that it's also where you have a community that wants to have companies and wants those kinds of things. So I don't disagree with schools, but I think you can have good schools and that doesn't create it. It's other things as well. And it is happening, I think, anyplace—there's lots of places in this country where it's starting to happen.

Mr. FINEGOLD. I think that one of the important things that were unique to this area are the role models, the ability to—see, when Dave Stem and myself were at Intel we were looking at stories like Jim's; we were looking at Gordon Moore or Bob Noyce or Andy Grove and we said, "Hey these are the role models." We even have your Friday beer bust parties.

Mr. TREYBIG. Excuse me, we changed that to Friday popcorn.

Mr. FINEGOLD. We'll have to think about that one.

But, seriously speaking, we really had role models to go after because ever since the group that came out of Fairchild, people have been looking at them and saying, "I can do that, too." And it was also easy to convince other people who came with you to show them the story of Tandem, to show them the story of Intel, to show them the long stories of other companies.

And one of the interesting things is to track down successful startups have—I know it's going to happen to me too one of these days—but successful startups have come out from successful startups. You know, in the bay area, we have this genealogy, who came from whom, et cetera.

And you'll track that usually successful companies came out of successful companies because they had role models and they could show other people and it was easy to convince. It is a little harder to do in Detroit or other places, to convince somebody "I'm going to be Mr. Ford, too, and do the same thing."

I think one of the things that works in favor now of other places, besides the Silicon Valley, is that names like Gordon Moore and Jim's name and others and the success story is all over. Because among other things he's got his subsidiaries and R&D center in other places, and Intel is spread all over the United States. And those stories go out to Phoenix and Austin and Oregon and the other places and those people also start doing a lot of Silicon valleys there because they have the role models.

And the story is not only something told in the San Jose Mercury, but something that's been told in Business Week and other places. So young Americans elsewhere have role models to look for.

Ms. KURTZIG. Well, as I said in my brief statement, I think that certainly there are some things that make Silicon Valley unique. I think one of them is the weather. I mean, people like to live in the warm weather if they have a choice. So that sort of adds to the Silicon Valley culture here. And that's probably why some other centers, like the Austin, TX, and Florida and the Carolinas also are starting to have technology centers.

But I mentioned, I really think that if you look at the characteristics of the high technology companies and look at them as high growth companies, and then you study that against the 100 CEO's in the ABC, there are only about 2 or 3 of us in Silicon Valley that are in the 100 CEO's of the American Business Conference. There is a large number from Boston, though, I will admit. There are companies from all over the United States that are represented by the ABC and I think the characteristics of those growth companies are pretty similar to the characteristics of the Silicon Valley companies.

The reason why there is more focus on Silicon Valley is, one, it's all high tech; and two, geographically we're all located in one area. And certainly having the role models and having the universities close and having the lifestyle that is here is very conducive to the large number of startups here.

I think with our high housing prices, there are a lot of companies that are moving outside and there are a lot of startups that are going into even Nevada and other places. And so I think that the type of things we're asking for—the R&D tax credit, the incentive stock option, and capital resources; and if we get the venture capitalists to invest more, which I think they are, since a lot more venture capitalists investing in Texas and other places—that you will see a lot of growth companies starting up in other areas besides just here and 128 in Boston.

Representative ZSCHAU. Congressman, may I ask one more question?

Representative LUNGREN. Certainly.

Representative **Zschau**. In talking to people in the Congress about the stock options, a common response that I get is, "Well, this enables a few people in a company to make a lot of money," presumably at the expense of somebody else. I don't know exactly who that is; their shareholders, I guess. And, therefore, that was the reason why the limitation was put on, that you could only issue incentive stock options valued at $100,000, that that would prevent any individual or small group of individuals from making too much money. We in the Government have some idea of what too much is, I guess.

And I'm wondering how you would recommend that I respond to these questions that are raised that really the stock option is for the few and it enables people to make more than they should be making.

Ms. **Kurtzig**. Congressman Zschau, I think first of all the $100,000 cap, which is the real problem, is not a problem when you're just starting a company because the stock is worth a penny so you can get an awful lot of stock at a penny a share—or maybe it's even 10 cents, but whatever it is it's a very low price. So the founders get a lot of stock, the initial few get a lot of stock for $100,000 cap.

The problem is really in that all employees in most companies have stock options, or at least the majority of employees get stock options within a technology company. And the problem is as you're trying to create more jobs after the startup phase when the company goes public and there is a market value that's, you know, a very recognizable market value because it's a public company the $100,000 cap becomes a real problem.

And so it becomes a problem when you're trying to continually grow these companies and when you're trying to hire employees past the startup when you're really discouraging the additional jobs because a $100,000 cap comes, you know, pretty quickly in a buoyant market.

Representative **Zschau**. For example, what do you do if your market value is $225 million and you're trying to get a new president for a company? You're bringing somebody in and you'd like to put together a benefits package that has very high incentives on future growth, can you use stock options effectively under the current law?

Ms. **Kurtzig**. Well, as you know, we did bring in a president and what we had to do is structure a program such that he got up to the $100,000 in incentive stock option and the rest had to be nonqualified stock options. And those nonqualified stock options are very heavily taxed.

You know, you have to pay the tax as soon as you exercise the option, so that you have to reequate what the real value is going to be, and it becomes very difficult, very costly. I mean, you can't do it—you can do anything you want to do if you really put your mind to it, but it becomes more difficult to attract the kind of people you need to grow the company and to give them the kind of incentives to keep that growth going.

Representative **Zschau**. Anybody else?

Mr. **Treybig**. First, I'd like to suggest that you don't do anything that encourages new presidents. [Laughter.]

I might disagree a little with the $100,000 limit, but its sequentiality. As an example, our stock price has dropped from $480 to $18. And since every employee has shares it would be to our benefit now to offer new shares at a lower price. But it gets very complicated because of the sequentiality. So if your stock price always went up linearly it's not so much of a problem. But this sequentiality is a horrible problem.

And the other preference tax. Now, I have suggested that if a person makes under some amount—has some income for the year under $20,000—we give options to every assembly worker and she or he is forced to sell their option. When they exercise them they have to sell them to pay preference tax, which they don't want to do.

I'm for some kind of program that at least doesn't have preference tax on options for people making under $50,000 or $20,000, or something, because I don't see why we want to discourage the ownership of those people.

I'd also like to suggest that the junior stock option concept, which was changed just recently—it's a concept of finding other ways to have options where you don't have this preference tax or this—it's not just presidents coming in, but anybody coming in, so that when they exercise their option they pay huge taxes.

And especially for officers where you can't buy and sell except in 6-month windows, it's almost a nightmare. Actually, it's not clear options have a value coming in. So whether it's junior stock options or whatever the approach, we need some approach that allow people to participate in the success of a company. And I don't think we have that today.

Not to suggest that the Government isn't trying. It's just that it's complicated and there are lots of different kinds of companies, and I know we may not be typical. But I think we are typical of the wave of the future, which is employee ownership. And there are not incentives for people to have employee ownership at a broad level in a corporation; there are negatives.

Mr. LASCH. And it's not a matter of tax avoidance, because those gains are taxed. It's just when they're taxed that's causing the problem. So it's very regressive, actually.

Mr. TREYBIG. I just wanted to add one more thing. I must also second this thing on immigration, I want to get this point in somewhere because I left it out. I think it would be the worst thing we could ever do if we made all of the—we don't have that many people from overseas, but we have a lot, but not percentagewise.

And if those people had to leave and go back it would be horrible for our company. All of a sudden we'd be competing against more companies from overseas with the very same people that would prefer to be here. And it would be a very, very negative thing, the proposed change in immigration.

Mr. FINEGOLD. I just want to emphasize the importance of retaining employees and I want to leave you with one experience that I had, now that I'm dealing with all the semiconductor industry. I don't know if you realize that the biggest business in semiconductors is memories. I've talked now to three different Japanese companies. The design team that designed the 4K RAM is all three companies they stayed through and designed the 16K RAM and the

64K RAM, 256K RAM, and they're sitting there now designing the 1 million.

While I was working at Intel—and they had an excellent record relative to the industry of retaining employees—every generation of memory has a brand new people. And I don't know the experience in other companies, but you go to almost any company in technology like that and they are incapable of retaining. In the U.S. companies we go and do it from the start.

So here is a company like Intel that invented the random access memory and had the long leads in that market, but lost it to the Japanese because the Japanese were maintaining. In all those different companies, it's the same team working there for the last 10 years developing time after time after time. Whereas an employee at Intel who had stock option at Intel, I was enticed to sell those stocks and lost any interest in the company from that point on because to avoid double taxation I had to sell my stock at Intel.

So that thing happened to the terrific team they had that designed those memories and they have to retrain people and start all over again.

Representative Zschau. Congressman, I want to thank and compliment our witnesses. I think, as I said before, this is a breath of fresh air. It's a group of people who've created jobs, who know where jobs come from, and they say to create an environment for all growth, not just high technology, not just Silicon Valley, but all growth everywhere. Thank you, Congressman.

Representative Lungren. Thank you. And I would just ask one question. And this is prompted not from my feeling, but from something that some witness said to us in our earlier hearings back in Washington when I was trying to ask them from the outside, how they saw Silicon Valley and why Silicon Valley was so successful in having these spinoff companies and all these startup companies generated over the years, and why they didn't have it in their areas even though they had a strong educational base and so forth.

And I'd just like to have your response to this. They said: "Well, obviously the biggest difference is that California and particularly Silicon Valley gets massive Federal funding, particularly in the area of defense." And I would just like your response to that because that was theirs—I don't want to say defense, but they were trying to figure out why Silicon Valley had succeeded where they had not succeeded. What would you say to that kind of a response?

Mr. Finegold. I don't know anybody that's sitting here that's been using any of defense contracts or anything of that nature. So it certainly doesn't play any role in the business we're in. That doesn't mean that we don't sell to military, but we haven't used a penny from their coffers.

Representative Lungren. Just one last question I'd like to direct to the other three of you, because I think Mr. Finegold has talked about it a little bit. We had just a little bit of disagreement about essentially having outstanding educational institutions of higher learning here. Mr. Treybig indicated that you have areas like Chicago that have it but doesn't have the success of Silicon Valley.

And Ms. Kurtzig said, "Well, you have venture capitalist here." And Mr. Finegold said, "Well you have the role models here." I guess the question is: Why do you have the venture capitalists here? You mentioned weather and it's nice to be here and so forth, but was there something about the business environment here that encouraged venture capitalists?

The reason I ask that is because you look in the literature and they say: "Look at the influence of the MBA Program at Harvard, they went to all the Fortune 500's and they taught them how to run their companies." And maybe they did and maybe they didn't. Yet you're indicating that we have venture capitalists here that formed a happy marriage with the entrepreneurs who were here and the technical side that was here.

Does anybody have any idea why we had the venture capitalists here that had faith in you folks, that involved themselves with you folks?

Mr. **Treybig**. Well, I'd like to say that I think it's an additive process. And one of the reasons we may have differences is that it's just what's most important at some time. But imagine that you had a venture capitalist somewhere, or someone that would invest money, just one person. Then they invested in somebody that had an idea. Then that company started and other money was invested and that company went public.

And liquidity is important because then they could get their money back. That's the stock market comment earlier. And when they made the money, other people in the community looked and they said: "Oh, that's interesting. He's not very smart and if he can do it, I can do it." Just a few of those people and someone else with money thinks that's pretty good.

So then there's another one that starts and another one, say, or two or three. And then some more people make money so there's more capital in the environment and this kind of builds in the community and they think it's OK to go to a startup. You know, in West Germany you don't go to work for a little company because it's not accepted culturally—I guess that's the right word.

So this process builds and then along comes a real estate guy. And if you go down we have whole rows of companies like tract houses. And if you do good then they'll give you a bigger tract house and if you fail, well, then you got back to the little tract house. That's OK because a failure is accepted.

So then this is an additive process and it builds. So you have to have a vibrant stock market, you go to have aggressive people. And this process started out here 25 years ago, or maybe longer, and it's built over time and it's exploded in the last 10 years.

And it's starting today in Austin, TX, and it's happening in Phoenix and it's happening in Oregon. It's happening everywhere. And the thing the Government did was when they lowered the capital gains, if you've ever seen the charts, there was incredible change.

And without the incentive for the venture capitalists, for the real estate people, for the employees, for everybody—because this is a high risk process—1 out of 10 makes it big, and then 3 out of 10 fail and that's second-best. Because the worst are the other six that live and do nothing because they always want more money.

So it's an additive process and all of these things are important, including the schools and having people. I don't know, that's how I describe it in speeches I give.

Mr. **Lasch**. I really believe that Jim is right in one way. There was very little venture capital in this area, say, 30 years ago. There were probably very few people that were doing that. The Government provided an enormous amount of stimulus to venture capital by the Small Business Investment Corporation plan in which they had matching funds.

And I think Fritz Johnson can tell you more about that later on. But I think that it was one of the principal ingredients that caused this burgeoning of venture capital.

Ms. **Kurtzig**. Well, I think that—you know, echoing a little of what Art and Jimmy were saying—if you did a genealogy of the companies in Silicon Valley, I would assume it starts with Shockley's company; and I think you could do a genealogy of the venture capitalists in exactly the same way. And you'll see that they were formed with a few starting and then there have been a lot of spinoffs in that. And I think there are a number of reasons why they are here.

One is, as they're funding these small startups, the better venture capitalists—the Pitch Johnsons and the Burt McMurtrys and the Frank Caufields—want to stay close to the companies that they are sponsoring. Because besides giving money they also help these companies in developing their management and in their early stages. So they want to be close to the companies that they're financing.

And since, as we've already determined, there's a large number of startups in the Silicon Valley, this is where they want to be close to. I think you're seeing the venture capitalists branching out; you go into Boston and you have TA Associates and, you know, Greyrock, you have a lot of venture capitalists in the Boston area.

And you're starting to see the venture capitalists in the Northwest and in Texas and in other areas just as you're seeing those high growth and high technology companies moving and starting in other areas as well.

Representative **Lungren**. Well, I want to thank this panel. We could go on and on and on. You're certainly assisting us in our inquiry here. I am from California but I'm closer to—well, Signal Hill is in my district, which is the second largest oil find in the United States for the longest period of time.

And I hope you don't mind if I sort of think of you folks as the wildcatters of this generation. I guess the investment and the venture capitalists of the 1920's were in oil wells. And the venture capitalists of this time are in ideas and intellectual properties. And maybe that's why you were successful here; the folks here were willing to put their money in intellectual properties.

And now that's a proven entity and maybe that's why it can expand to places elsewhere. Thank you very much for your testimony. It's been very, very helpful.

I would ask the panel to come forward. Mr. Frank Caufield, Mr. Franklin Johnson, and Mr. Burton McMurtry.

This is the fourth and concluding panel in 2 days of hearings. And although all of them have focused on the Silicon Valley, we've tried to have a slightly different perspective with each panel.

Without the vibrant venture capital community it's obvious that the Silicon Valley would not be what it is today. Launching new companies and financing their development requires enormous sums of money and the risks are high. The gains from successful deals can be spectacular, but obviously many venture capital deals will fall by the wayside.

This committee is particularly interested in knowing more about the availability of risk capital in the Silicon Valley and its contribution to the region's overall climate for entrepreneurship and innovation. The rapid growth of venture capital funds since 1978 has been documented in a number of studies and it's been alluded to by the previous panel.

These studies have also confirmed that the availability of risk capital is quite sensitive to Government policies such as taxes and regulations. The committee would like to know more about how tax policies and regulations affect risktaking and innovation. Also the relationship between the Silicon Valley's entrepreneurial community and its venture capital community is of interest to the committee.

How are deals discovered and made and what can the Government do to assist the venture capital process? At the same time, what are the most significant barriers to business development financing and what can be done at the Federal, State, and local levels to remove these barriers?

We are very fortunate to have before us a panel of experienced venture capitalists from the Silicon Valley region to help us find answers to many of these questions. Gentlemen, we do welcome your appearance before our committee this morning and we look forward to hearing about the Silicon Valley phenomenon from your perspective, that is, the perspective of the venture capital community.

And I would just say that if we could have the opening statements around 10 minutes then we'll go into questions and answers. And I know questions will be prompted by what is said there, and we've already had questions prompted by our previous panels. So maybe I'll just go in order from left to right and ask Mr. Burton J. McMurtry, general partner of Technology Venture Investors of Menlo Park, and vice president and secretary of the NVCA to make the first presentation.

PANEL 2. VENTURE CAPITAL FINANCING: A SILICON VALLEY PERSPECTIVE

STATEMENT OF BURTON J. McMURTRY, GENERAL PARTNER, TECHNOLOGY VENTURE INVESTORS, MENLO PARK, CA

Mr. McMurtry. Thank you. It's a pleasure to be here.

What we thought we would do is give just some brief biographical information about the three people giving testimony and then move directly into the questions and hopefully compress some time and leave a lot of time for questions.

I was born and raised in Houston, was educated at Rice University in electrical engineering. I moved to California in 1957 to go to work for GTE-Sylvania in engineering and I worked for them in a number of capacities for 12 years. I also went to graduate school in engineering at Stanford while I was working.

In 1969 I made a very abrupt move and moved into the venture capital business specializing in financing low capitalization start-ups only in the San Francisco Bay Area. And we had our head handed to us quite a few times, I have to say, in some of those investments. But some of them ultimately turned out to be exceedingly interesting. In fact, one that we were an early investor in was ROLM Corp., which I know you visited yesterday and which is certainly a stellar company.

In 1973 several of us got together to start a new venture capital partnership. And we knew that venture capital was hard to raise, but we didn't quite know how hard it was going to be to raise. Four of us spent 6 months full time trying to raise the money, barely got it done, and we raised $19 million in 1974, which turned out to be one-third of the total capital invested in the venture capital business during that year.

That partnership continued and progressed well and, again, with a lot of difficulties. But that's the nature of this business. And you hear a lot about successes, but in fact we spend a lot of our time with failures and imminent failures. And some of those we turn around and some of those we do not.

In 1980, while continuing in this earlier partnership, I started a new partnership with several other partners. We have a total of about $150 million under management. We have invested about $57 million in 40 different companies. We serve on the board of directors of about 70 percent of those companies and are continuing to focus on early stage companies.

About 80 percent of our investments are right in the San Francisco Bay Area. And 99 percent of our investments are in the Western United States. So we're perhaps unusually geographically focused.

I think the only other comment I'd like to make as an introduction is that I'm fascinated by the questions that were raised earlier about: How does this process begin? Does it begin with the venture capitalist, does it begin with the entrepreneurs? How do you foster this climate?

Rather than repeating, I would just say I would agree with a lot of what has been said about what are the ingredients that permit Silicon Valley. But I would also emphasize that the entrepreneurs really drive the process. And in my view, venture capitalists will find the entrepreneurs. I don't think you can say absolutely that it begins with the entrepreneurs in a total vacuum.

But basically venture capitalists will find the entrepreneurs. And if they're in California or if they're somewhere else they're going to find them. So I think one should concentrate on the climate that would foster entrepreneurship as being something that is acceptable and worthwhile. And I think venture capitalists, particularly given the tremendous flow of venture capital since the capital gains tax reduction, are going to find the entrepreneurs.

So I think we would all agree that entrepreneurs are the absolute top of the list and the critical ingredient in this process.

[The prepared statement of Mr. McMurtry follows:]

PREPARED STATEMENT OF BURTON J. McMURTRY

Mr. Chairman, I am Burton McMurtry, Secretary and member of the Board of Directors of the National Venture Capital Association which has presently 176 member companies. The association was formed to create a broader understanding of the importance of the venture capital to the economy of the United States. It also works to stimulate the free flow of capital to young companies.

I am also a general partner of Technology Venture Investors, a venture capital firm located just a few miles from here in Menlo Park. I have submitted separate testimony which provides more information concerning my educational and professional experience.

WHAT IS VENTURE CAPITAL?

Venture capital is the business of developing businesses.

The key to this process is the entrepreneur, or business person who starts his or her own company. Venture capital assists the entrepreneur with the money and expertise to make that company a success.

Most venture capital money comes from venture capital firms. These generally are private partnerships or closely held corporations funded by venture capitalists themselves, insurance companies, endowment funds, pension funds, bank trust departments, corporations, wealthy individuals and foreign investors.

Professional venture capital organizations invested $2.8 billion in 1983 to launch new businesses and finance growth of young companies.

But more importantly, these companies:

- o Create an unusually large number of new jobs and employment opportunities.
- o Improve living standards through accelerated applications of new technology.
- o Improve the productivity of all industry.
- o Generate significant new tax revenues.

These four activities have a vital bearing on the overall American economy and cannot be overemphasized.

Let me elaborate.

HOW VENTURE CAPITAL HELPS THE ECONOMY

A study by the General Accounting Office in 1982 looked at 72 companies that had been founded with venture capital funds during the 1970s.

Despite the fact that only $209 million was invested to start the firms, the study found that by the end of the decade: "Their combined sales in 1979 alone totalled $6 billion. Growth in annual sales averaged 33 percent a year and, in the process, these firms created an estimated 130,000 jobs, over $100 million in employee tax revenues and $900 million in export sales."

Contrasted with this growth and productivity, it should be noted, between 1977 and 1982, Fortune 1,000 companies lost 1.5 million jobs.

Another study by the American Electronics Association also shows the vital contribution venture capital plays in our economy.

The study examined 77 companies that had been founded with venture capital between 1971 and 1975. It found that in 1976, for every $100 in equity capital that had been invested, there were $70 in export sales, $33 spent on research and development, $15 generated in corporate income taxes, $5 in state and local taxes and $15 in personal income taxes from jobs created by the investment.

Because venture capital-backed firms are small businesses, they are also more efficient at utilizing their research and development and bringing new technology to the marketplace.

A 1977 study by the National Science Board indicated that small ventures utilized their research and development funds four times as efficiently as larger companies and that small businesses provided a majority of all the new U.S. innovations -- at least their applications.

In addition, it found that venture companies were able to commercialize their products faster, typically taking 3-5 years instead of the 7-10 years required by larger corporations.

Finally, roughly 80 percent of recent venture capital investments have been made in productivity-related products and services that will maintain America's productivity and industrial base.

We believe that venture capital finances the most productive part of the American economy and is critical to the continued technological leadership and economic growth and health of the United States.

Legislative changes are needed so it can do this better and more effectively.

CHARACTERISTICS OF THE INDUSTRY

The venture capital industry has a number of generally common characteristics:

- Financing of young and rapidly growing companies.

- Value added to the company by active participation of the venture capitalist. Not only does the venture capitalist provide money, but he rolls up his sleeves and becomes actively involved in the company, providing help ranging from management and recruitment assistance to technical expertise.
- Higher risk with expectation of higher rewards.
- Long-term orientation.
- An innovative business idea -- often high technology -- for a product or service, preferably proprietary.
- Equity participation for the investors.

FINANCING NEW COMPANIES

Venture capital generally goes to new and young companies in need of money to achieve major and rapid growth.

Typically, the money provided is categorized according to the company's stage of development.

In a company's early stage of development, venture capitalists provide: seed financing, or money for developing a business plan or concept; start-up money for product development; first-stage financing, in which the entrepreneur typically has a prototype and begins manufacturing.

One recent study found that some 50 percent of all venture capital funds were invested at this early stage.

Venture capitalists also invest money when a company is expanding. These expansion-stage investments include: second stage financing, in which the company is shipping its product but is still not profitable; third stage financing, in which the company is now profitable but needs money to expand operations; and fourth-stage financing, also known as "bridge" or "mezzanine" financing.

The final type of financing carries the company through to a public offering of its stock, merger or acquisition.

ACTIVE PARTICIPATION

Unlike other forms of investment, the venture capitalist becomes actively involved in the company in which he invests.

He provides the entrepreneur with expert business and management counsel, which can range from helping recruit and build a management team to being an experienced peer with whom the entrepreneur can discuss his problems.

Rather than simply providing money, the venture capitalist rolls up his sleeves and provides the business and management assistance that helps the entrepreneur make fewer mistakes and grow more successful more quickly.

This active participation adds important value to the company.

HIGH RISK-HIGH REWARDS

By investing in new, small companies, the venture capitalist is increasing his own risk of failure and loss.

However, by investing in small companies with the potential for rapid growth, the venture capitalist also has the potential for very large financial rewards.

While venture capitalists invest in small businesses, they believe they are investing in big businesses just getting started.

LONG-TERM ORIENTATION

Venture capital is a long-term investment.

While stock market investments are evaluated monthly, quarterly or yearly and emphasize short-term gain, the typical time frame from venture capital company start-up until the venture capitalist sells his investment is seven to 10 years.

Generally venture capitalists sell their investment through an initial public stock offering, or IPO, by the company or through the company's merger with or acquisition by another company.

Until this happens, however, the venture capitalist has an extremely illiquid investment and one that will remain so for a long time.

INNOVATIVE BUSINESS IDEA

Venture capitalists review literally hundreds of business plans in a year to find those few that may be worthy of investment.

This can be the development of a new technology. But that is not necessarily the case. Many venture capital investments have proven successful when entrepreneurs have identified major markets that can be tapped by the application of technologies already in existence.

Home computers were not an invention -- they were the application of existing technology to a vast new market.

It also is important that a business idea be proprietary in order to attract venture capital. No investor is eager to invest his money in what others can copy quickly and easily.

THE EFFECTS OF LEGISLATION

One final note. Federal tax and fiscal policy have an incredibly dramatic effect on the venture capital industry, which is why I'm here today.

We believe there are two issues that critically affect whether venture capital can continue to play its vital role in the American economy creating jobs, increasing productivity and maintaining this country's technological leadership. We would like to place those two issues before you and urge your support of them.

CAPITAL GAINS

The first of these issues is capital gains.

The difference between the tax rates on capital gains and personal service income directly affects the growing availability of funds to the venture capital industry for investment in new, emerging companies.

Let us briefly look at the history.

Beginning in 1969, Congress gradually increased the long-term capital gain tax rate so that by 1977, the maximum rate stood at just more than 49 percent. In addition, Congress had reduced the maximum tax on personal service income from 70 percent to 50 percent. Because both taxes were virtually identical, there was little incentive to risk investing in young and growing companies.

In 1978 that trend was reversed, however, as the capital gains rate was reduced to 28 percent. A further reduction to 20 percent was enacted in 1981.

The capital gains rate reductions of 1978 and 1981 and the subsequent increase in the difference between the tax on capital gains and the tax on personal service income dramatically encouraged investment funds for the development of new, small businesses.

It is this differential which provides the incentive to venture capitalist to take risks and invest in new, emerging companies.

During the three years preceding the initial 1978 reduction, venture capital firms only invested $1.8 billion in new business ventures. In the three years following 1977, $5.4 billion was invested by the venture industry in the innovative, independent business sector. This represents a 300 percent increase over the earlier period.

The chart on the next page dramatically shows the turnaround in investment activity.

STOCK OFFERINGS INCREASE

Not only did the capital gains rate reduction increase money available to venture capital firms, but it also spurred increased public offerings by venture capital-backed companies -- an important ingredient in creating a favorable climate for venture investing.

Net capital raised through initial public stock offerings grew from only $153 million in 1977 to more than $500 million by 1979 and more than $3 billion in 1981.

Both government and private analysts credit the two rate reductions with increasing individual investment and risk-taking, stimulating entrepreneuerial activity, accelerating the mobility of capital and fostering new productivity-enhancing investment.

I might add that these achievements were realized at no net cost to the U.S. Treasury. In fact, total capital gains revenues increased from $9.3 billlion in 1978 to $11.2 billion in 1979 and $11.9 billion 1980.

VENTURE CAPITAL INDUSTRY

ESTIMATED

FUNDINGS AND DISBURSEMENTS
(Millions of Dollars)

Year	New Private Capital Committed to Venture Capital Firms	Estimated Disbursements to Portfolio Cos.	Public Underwritings of Companies with Net Worth of $5 Million or Less	
			Number	Amount
1983	4,100	2,800	(477)	$3,671
1982	1,700	1,800	(112)	617
1981	1,300	1,400	(306)	1,760
1980	900	1,000	(135)	822
1979	319	1,000	(46)	183
1978	570	550	(21)	129
		Capital Gains Tax Decrease		
1977	39	400	(22)	75
1976	50	300	(29)	145
1975	10	250	(4)	16
1974	57	350	(9)	16
1973	56	450	(69)	160
1972	62	425	(409)	896
1971	95	410	(248)	551
1970	97	350	(198)	375
		Capital Gains Tax Increase		
1969	171	450	(698)	1,367

Source: Venture Economics

CAPITAL STILL A PROBLEM

Unfortunately, even though there was a three-fold increase in the amount of new capital being made available to young companies after the capital gains tax reduction, recent Congressional testimony reveals there still is an estimated $6-7 billion annual equity shortfall.

What that means is that the private sector is being restricted from providing all the new jobs, productivity and technological advances possible. And the loser is the American economy and public.

MAINTAIN DIFFERENTIAL

Legislative efforts in the capital gains area are critical to further increase risk-taking and thereby provide more dollars for start-up companies and young, high-growth, job-producing independent businesses.

Most important is that we maintain or increase the current differential that exists between the capital gains tax rate and that for personal service income.

Whether we maintain or increase this difference will determine whether we maintain a favorable investment climate and encourage the long-term, risk-taking investment that sustains young and growing companies.

Other proposals have been made that also would be of assistance.

One is to reduce the corporate capital gains tax from 28 percent to 20 percent, the same as it is for individuals.

Between 1978 and 1980, more than 30 percent of all new capital committed to venture capital firms was affiliated with corporations. In 1981 and 1982, however, that figure fell to approximately 20 percent.

One of the key reasons for this was that the capital gains rate for corporations wasn't reduced as it was for individuals.

Reducing the corporate capital gains tax to 20 percent now would place the corporate investor on par with the individual and encourage corporate investment in small and growing businesses.

Another proposal also would help.

If the realized capital gains on an investment were reinvested or "rolled over" into a small business concern within 18 to 24 months, the payment of the applicable capital gains taxes could be deferred until the taxpayer sold the small business securities and didn't roll over the investment again.

As I noted earlier, the General Accounting Office found that a mere $209 million investment in 72 firms created an estimated 130,000 jobs, more than $100 million in corporate tax revenues, $350 million in employee tax revenues and $900 million in export sales.

If a mere $209 million can produce such impressive and disproportionately beneficial results, imagine how the economy would respond if between $10 and $20 billion in venture funds were being invested each year!

INCENTIVE STOCK OPTIONS

I would now like to address the second issue of vital importance to the venture capital industry -- incentive stock options (ISOs) -- and ask your support.

Incentive stock options are critical to the venture capital industry. Such options have three beneficial effects: new and emerging companies unable to pay large salaries can attract talented people; companies are managed for the long term; employees have incentives to perform their jobs better and make their companies more productive.

Congress has long recognized the importance of allowing employees to own a piece of the company. It has enacted legislation permitting employee stock option plans (ESOPs), employee stock purchase plans, and qualified and restricted stock option programs.

However, in 1975 Congress took a step backward by disallowing qualified stock options.

What that meant was that when an employee exercised his stock option, to the extent that the fair market value of the stock exceeded the option price, that difference or "spread" was taxed as ordinary income in the year the option was exercised at the option price.

That meant that ordinary income taxes were due on the option even though no cash income had been realized and even though the employee might realize a loss if the subsequent sale price of the stock was lower than the original purchase price.

This for all practical purposes prevented widespread use of the stock option to attract and build quality management teams in new companies.

Such management is critical to the success of small and emerging businesses.

CONGRESS CHANGES

In 1981, Congress concluded that not allowing employees an opportunity to share fully in the growth and development of their companies was counterproductive. It decided that employee stock options programs cause wage earners to be more innovative and more productive, which in turn makes American industry more competitive.

And that benefits society as more jobs are created and inflationary pressures are reduced.

Therefore it passed legislation that, subject to certain conditions, allowed stock options to be treated as capital gains and eliminated any tax consequence at the time they were granted or exercised.

STILL PROBLEMS

Unfortunately, as a result of almost three years of experience since enactment, it is now apparent that three of the legislative conditions have acted to severely limit the effective use of ISOs by companies seeking to increase their rate of productivity.

The first drawback is that the law included the spread between exercise price and fair market value as a tax preference item, which is used in calculating the alternative minimum tax.

This means that someone receiving options can be subject to 20 percent tax on a paper profit at the time of exercise.

And that means that a person can be subject to a double tax -- the paper profit at time of exercise and the capital gains tax at time of sale.

In addition, he also is paying a 20 percent tax on what could turn out to be a capital loss.

And he also has to pay the tax when he does not have the cash!

The second drawback is that an employee can be granted only options which have a fair market value of $100,000 or less in any one year.

This serves as an artificial and arbitrary cap on incentive.

Finally, options must be exercised in the sequential order in which they are granted.

This severely diminishes the value of the option, particularly if the exercise price of options granted earlier exceeds the current fair market value of the stock or ISOs granted later have a lower exercise price.

To help a broad-based work force realize the American dream of owning a "piece of the action," businesses in all spectrums of growth and development -- emerging, high-growth or more mature, stable companies -- should be able to grant stock options that don't penalize the employee.

THREE ACTIONS RECOMMENDED

We therefore would recommend three actions.

The first is to amend section 57(a) of the code to eliminate as a tax preference item the "spread" income that exists when an option is exercised.

The second is to amend Section 442A(a) of the Internal Revenue Code to remove the $100,000 annual ceiling on ISOs.

The third is to amend the same section so that options don't have to be exercised in sequential order.

Job creation, innovation, productivity and market competitiveness in the international arena are based upon the talents of imaginative, entrepreneurially-oriented employees in both emerging, growth-oriented independent businesses and in larger, well-established companies.

It is precisely these types of individuals who are attracted by the opportunity to participate in high-risk, high-reward investment programs as opposed to less generous and less demanding, but more secure, salaried positions with other firms.

Incentive stock options need to be legislatively modified to make them a more attractive and useful compensation device.

CONCLUSION

In conclusion, we at the National Venture Capital Association believe that action in the two areas of capital gains and incentive stock options -- by helping the most dynamic segment of our economy -- can provide more jobs, productivity and better maintain America as the world's technology leader.

I appreciate the opportunity to present the foregoing information to you.

Representative LUNGREN. Thank you. Next we have Mr. Frank Caufield, general partner of Kleiner, Perkins, Caufield & Byers, San Francisco.

STATEMENT OF FRANK CAUFIELD, GENERAL PARTNER, KLEINER, PERKINS, CAUFIELD & BYERS, SAN FRANCISCO, CA

Mr. CAUFIELD. Thank you, Congressman and members of the committee. It's a pleasure to be here. I have been active in the venture capital business since about 1972 when I became a partner of a small venture capital fund called Oak Grove Ventures in Menlo Park. From 1972 to 1978 I was with this partnership and we invested in approximately 20 small companies, some of which were successful and some of which weren't. But I learned something in the process and I've been getting better at it.

In 1978, I joined with Eugene Kleiner, Tom Perkins, and Brook Byers to form Kleiner, Perkins, Caufield & Byers, which has since then become one of the largest if not the largest, venture capital firm in the country. That partnership and its two successor ones have raised about $220 million and have invested in 86 companies as of yesterday. It may be more as of this morning.

Of these companies, 17 are public and the market value of all of the companies in the portfolio of those three funds is something over $3 billion. Rates of return for the three funds have been between 45 and 75 percent per year.

I was president of the Western Association of Venture Capitalists from 1976 to 1977. I'm a director of the National Venture Capital Association, and I'm on the board of five public and a number of private companies.

Biographical data: I'm an Army brat, I lived most of my precollege years overseas. I went to West Point and Harvard Business School. Thank you.

Representative LUNGREN. Thank you.

Next, Mr. Franklin P. Johnson, general partner of Asset Management Co.

STATEMENT OF FRANKLIN P. JOHNSON, JR., GENERAL PARTNER, ASSET MANAGEMENT CO., PALO ALTO, CA

Mr. JOHNSON. I'm a local fellow. I went to Palo Alto High School and went to Stanford, was a mechanical engineer, went to Harvard Business School. The west coast venture capital group is pretty much an engineer's and MBA's combination. It's an interesting phenomena that would apply to most of us, although Burt went on and got much higher degrees in the technical field.

After business school I went in the Air Force for 2 years and then, as a good MBA, started my professional life in the smokestack industry hoping to work to the top of a big company. And I worked in East Chicago, IN, in the open hearth department there at Inland Steel Co. I became foreman and a general foreman and then assistant superintendent of an open hearth.

Then I got the entrepreneurial bug in 1962, joined another man who had left Inland just before I did named William Draper. And we found a small SBIC in Palo Alto, where I came from in the first place, where the weather was definitely better, and started in the venture capital business in 1962.

Bill Draper and I worked together for several years and then another company came along and bought our portfolio. And at that point, Bill went to work managing that company, which is Sutter Hill Ventures, a very well-known firm. And I went on my own as a private venture capitalist and did it essentially as a private person.

We were able to get started, however, because of the wisdom of Congress of passing the Small Business Investment Act of 1958 which was, in fact, the seed activity that launched many people in the venture business and in fact started the venture capital business, I would say, in the bay area, the results of which you can't see from where you're sitting but they're shown on the chart at left.

Then after being a private venture capitalist from 1965 until 1982 I formed a partnership of universities and pension funds and formed another one earlier this year. We have about $65 million of original capital under management, plus the private capital that we formed in the course of our activities over the years. We've made investments in about a hundred companies and invested about $25 million over the years.

They are all over the country, although most are in California. I'm a director of seven public companies and five private companies. I served 12 years as a trustee of Foothill and De Anza Colleges, which is the local community college district. And I'll come to that in some of our discussion about the importance of education. And I teach a course in entrepreneurship at Stanford Business School every year in the springtime and I've done that for 6 years. And that's the end of my biography.

[The prepared statement of Mr. Johnson and the testimony of the National Venture Capital Association, presented by Mr. Caufield, Mr. Johnson, and Mr. McMurtry, follow:]

PREPARED STATEMENT OF FRANKLIN P. JOHNSON, JR.

A WORKING HYPOTHESIS

There is widespread agreement in most industrialized countries that the development of industry which utilizes modern science and technology should have a high national priority because of the resulting economic and social benefits. No consensus exists, however, that the technological entrepreneur should be the primary agent for that development.

The spectrum of attitude toward the entrepreneurial approach runs from virtual prohibition, in some of the communist bloc, through various degrees of planning, controls, limits, and taxation, to substantial freedom of action in several capitalist countries. The countries doing best in technological innovation so far have been at that portion of the spectrum which encourages substantial economic freedom for all entrepreneurs and establishes a climate of support and encouragement for them.

Very few civilian products using new technology are developed in the Soviet Union, for example, but some appear in the marginally more liberal atmospheres of some other communist countries. The Japanese, on the other hand, have been able to build strong and successful production and marketing organizations using strong economic incentives, but combined with coordinated national planning and only a modest level of entrepreneurship. They have yet to demonstrate, however, much skill in bringing very new technology to the marketplace and have been, so far, substantially dependent on importing such technological innovation. Major efforts are now underway in Japan, however, to attain innovative leadership through government support of such projects as the development of the "Fifth Generation" computer, utilizing artificial intelligence and expert systems. Substantial efforts are also being made by Japanese banks and government agencies to encourage the formation of venture capital entities, but the more general problem of the total entrepreneurial climate is not being visibly addressed.

The United States, with few controls, has had a very strong burst of entrepreneurial activity in bringing products of new technology to the marketplace. This activity has required the application of market sensitivity and engineering to new discoveries in applied science, with science and education being the primary focus of direct government support. The USA appears to be at the free end of the spectrum from most vantage points. The Americans, however, have lost large parts of markets in mature technologies they helped develop to the mass production and marketing skills, and national coordination of Japan. In fact, there is concern among some American technological businessmen, particularly in the semiconductor industry, that the USA will become the prototype shop of the world. The American way is not without its problems.

While the Japanese and American experiences do not permit us to say that the evidence fits some neat and simple curve, a look at the whole range of attitudes toward entrepreneurship and the results clearly suggests a working hypothesis:

> A climate which actively nurtures entrepreneurial activity with a minimum of restrictions will be the most likely to produce the most rapid and long-lived growth of industry based on modern science and technology.

I will leave it to the academic community to rigorously check this hypothesis against a greater body of evidence. I am certain, however, that my colleagues in the practice of the entrepreneurial arts are very anxious to prove the hypothesis right, whether or not the theory is ever well developed. That desire, of course, is one reason that the entrepreneurial system usually works so well.

Countries which have strong industrial bases utilizing the continuing advances of technology will have the exports and jobs to build strong economies. Well financed entrepreneurs are the best builders of these bases. Countries without strong entrepreneurial segments will languish with stagnant economies, unemployment and uneconomic jobs, and capital leaving or seeking to leave the country.

One worldwide set of entrepreneurial conditions will not work in every country, because of history, custom, and mentality. There are some general elements of a successful climate, however, which when given local rules by people who know the country can maximize the odds that a nation will have a thriving technological industrial sector.

MAKING AND KEEPING MONEY

The most important single element of a strong entrepreneurial environment is the existence of the opportunity for individual people to make and keep money. The ability to make it is dependent on personal ability and the economic environment, but the ability to keep it, once earned, is primarily dependent on tax rates, both ordinary income and capital gains. For the entrepreneur and his backers, very low or no taxes on gains from the realization of increases in capital value are a vital condition.

One important benefit of a low capital gains rate, other than the strong incentive to start or invest in a business which will grow rapidly in value, is that capital can be moved from one investment to another without penalty. This permits an investment by a start-up specialist to be sold to an investor who likes more seasoned companies and the capital recycled to new firms. Capital at all levels of the risk-reward ladder thereby has the minimum inhibition in seeking new opportunities. This condition not only allows capital to be returned more quickly to start-ups, but is more likely to open up access for growing companies to the capital of broadly based individual shareholders.

A low capital gains tax rate also gives the entrepreneur incentive to leave his company's earnings in the company and increase its capital base, earning power, and growth rate. This incentive is blunted in some countries, however, by undistributed profits taxes. Even with low capital gains taxes, ordinary income taxes must be moderate enough so that people are strongly motivated to attempt to produce, and earn more keepable money.

Growing companies need to attract good people. The creation of option schemes, gains from which can be treated as capital gains, will help attract talent to the long hours, low pay, and career risk inherent in new business. Such options give their holders the opportunity to have a carried interest in the increasing value of the company. If the company does not increase in value, their options are worthless; if it does increase, the increased value is shared with the option holders by the other shareholders. Since ordinary income is heavily taxed in most countries, such options would be very powerful attractions for talented people, including those who might otherwise emigrate.

For the most part, entrepreneurs and venture investors are not heavily oriented toward ordinary income, so that reducing a country's ordinary income tax rates, although it may be desirable for many other social and economic reasons, does not have to be as high a priority for this purpose as keeping capital gains taxes low. High income taxes, however, keep salaried people from generating savings to use as a capital investment base, which increases the need for options as capital gains tools to give people without any capital a chance to get started in capital formation.

In the United States, nearly all of the entrepreneurs and venture capital managers who have recently generated a lot of personal wealth have been people who started their careers with little or no net worth. They normally have had, however, good technical or business educations, or both. A new generation has been able to generate personal capital and, by founding small and growing businesses, has created virtually all the net new private sector jobs in America, and about 30¢ in tax revenues annually for every $1.00 of equity they invested in new companies, according to American Electronics Association studies.

In any country it is important to develop a political consensus that it is a good thing for the country if those who start and finance successful ventures can make, keep, and be free to redeploy their capital. Without such a consensus, changes in policy, or feared changes in policy, can destroy the climate for success, which needs a long and consistent life.

EMPHASIS ON EQUITY

A second vital element is the availability of capital in amounts adequate for young businesses to be founded and grow primarily with equity capital, rather than debt. The amount of permanent capital required to fund a technological business can vary from under 10% of annual sales for a software company to well over 60% of sales for some electronic manufacturing companies. The greater the portion of this capital that is in the form of debt, the lower the earnings, because of interest, and the greater the likelihood of serious financial trouble in the inevitable event of a rough spot in the company's performance.

For this element to be effectively in place, small and growing companies need low corporate tax rates and the freedom not to have to distribute earnings needed in the business. Depending on the profitability and growth rate, retained earnings can be the primary or even sole source of growth capital. Very broadly speaking, a company can grow at a yearly rate up to its rate of return on equity without needing additional outside capital.

Outside equity capital is almost always required, however, for new companies with substantial goals, as well as for rapidly growing companies. If competently managed capital is available, and its managers can see rate-of-return opportunities great enough to make up for the risk of start-up and young companies, ventures with good chances of sufficient success can attract capital. Because such managers have other, presumably safer, investment opportunities, at good rates, they are not likely to invest unless they can project a good chance of making a compound rate of return on their capital of 50-60%, or about 8-10 times in five years, with the investment then in liquid form. Their whole portfolio seldom reaches those returns, because of the failure or disappointing performance of some of the individual investments.

If the other elements described here are present, capital available for ventures may form, but form slowly, as money managers build confidence and competence in venture work through successful experience. The government can accelerate this process by lending capital at favorable interest rates to private investors who, rigorously selected for honesty and competence, will risk substantial amounts of their own money as equity in venture capital investment companies devoted to start-up and small companies. A program like this played a key role, after some false starts, in accelerating venture capital activity in the United States.

Another measure which governments can take is to legally free up some small percentage of pension and insurance funds for investment in private companies. Managers of such funds, however, are not normally experienced in direct venture investing, and invest through venture capital companies, if at all. The professionally managed venture capital partnership has emerged in the USA as the primary vehicle for such institutional investment in ventures.

If more equity capital becomes available to fast growing businesses, the use of borrowing can be reduced to seasonal needs and term financing of fixed assets. These are vital functions. Regulations which make it uneconomic for lending institutions to deal with small business should be reexamined.

A PUBLIC STOCK MARKET

The existence of a public stock market for smaller companies is another vital climatic element. As companies grow, they may become safer investments, but their capital requirements become larger, often too large for private investment. At this point these companias need access to public markets for capital, and the venture investors need liquidity to realize, at least in part, their return. The venture investors, and many entrepreneurs, would not have made their investment in the first place if there had not been a visible source of liquidity.

This is not an easy element to get into place. It can be aided by securities laws which do not overburden small companies seeking to sell stock, and by legally freeing up small parts of pension funds for investment in small public companies.

Merchant bankers and stockbrokers can help by orienting themselves to the underwriting and distribution of stock in good young firms with high promise, training people for such activity, and helping investors understand the risks and rewards of investing in emerging companies.

A POOL OF TALENT AND KNOWLEDGE

A growing pool of top flight scientists, engineers, technicians, and businessmen and women is necessary for a burgeoning sector of technology ventures. A growing fund of new scientific knowledge, developed locally, is a related requirement.

Such a body of skills and knowledge requires a national effort in education and research. While some pure research may be done in commercial laboratories, most fundamental exploration takes place in university or government facilities. Scientists and engineers who have worked in such laboratories or trained near them are often prime movers in technically innovative companies, normally after having acquired some experience. Faculty researchers, often top people in their fields, can play key roles in new companies without leaving academe.

Many technological firms are located near universities because their managers want interaction, and because the entrepreneurs are themselves graduates or faculty. This propinquity aids in the transfer of the scientific knowledge from the level of fundamental discovery in the university to the development of specific products to serve markets in commercial companies. The proper financial relationship between the two and between the academic researchers and the companies is the subject of hot debate now in the USA, but it is generally agreed that the university and its faculty should be able to benefit financially from their discoveries.

Most innovative firms, however, develop products on their own, using new science in only a general way and are primarily dependent on the intelligence, training, and experience of their technological and business leaders, especially marketers.

The establishment of a system for training paraprofessional people and technicians is another necessary condition. Technological companies need very few unskilled people, but, for example, need one or more technicians for every professional engineer, and large numbers of drafters, computer programmers, word processor operators, quality control inspectors, and the like. A workable system in use in California is that the community provides the training that is in general demand by the potential employees and employers, and the firms provide the training that is unique to their requirements.

As a community of technological companies grows, one important source of experienced talent for new companies is older and larger companies which have not been able to maintain their entrepreneurial and economic excitement. The very presence of start-up companies keeps the managers of the more mature companies alert to keeping their companies very attractive places to work, and gives them tough and continuing competition in the marketplace.

AVAILABILITY OF LARGE MARKETS

Large markets must be open to companies which have to spend substantial sums on development. While a company exploiting modern technology can start out small, those providing its equity will have to believe it will grow to a size and value large enough, fast enough, to give the required rate of return.

For example, if a small company needs $1 million in capital to develop a product and bring it to market, investors are unlikely to be interested if they do not believe that the equity which the $1 million will buy will be worth, say, $10 million or more in five years. If the whole company can only be worth $10 million in that time, the investors would have to own the whole company to achieve their desired return, a situation which would be of no interest to the entrepreneurs. If they believed that the company might be worth $20 million, however, they might settle for half the company, a deal the entrepreneurs might accept as well. It is clear that without a market size to permit the growth and size required to generate substantial market value the company will not get financed by equity oriented private investors.

For these reasons a strong combination of a national effort to understand the needs of external markets for technological products, and, for economic reasons, some joint marketing efforts among smaller firms may be necessary. Technology based industry will be an important factor in only the few largest economies without substantial export activities.

VENTURE CAPITAL AVAILABILITY

A pool of professionally and locally managed venture capital is an additional important element.

This implies not only capital being available for new businesses, but the technically knowledgeable, management oriented, professional venture capitalists managing the money. The providing of venture capital necessarily includes the providing of very large amounts of assistance to the managements in clearing the inevitable hurdles of entrepreneurship. Unless trained and experienced, bankers and fiscally oriented investors cannot do the whole job because they normally do not have the knowledge of technology and operating experience to make the risk investment judgements and to work hard with the companies to make their judgements come true. The venture capital limited partnership, with professional venture capitalists as general partners, is now the dominant and most effective provider of equity to high growth small businesses in the USA.

THE WINNING ELEMENT

Once consensus has been achieved, programs are in place, and a healthy climate emerges, the success of the effort is still not a strict matter of mathematical odds. There must be people, and plenty of them, who have the zeal, commitment, energy and singleness of purpose to undertake the difficult and dangerous entrepreneurial struggle for personal freedom and wealth.

This implies that a nation must not only have favorable tax laws and facilitating institutions to have a major entrepreneurial base to its economy, but it must also have a culture that appreciates and emotionally encourages those citizens who create national wealth by trying to achieve it for themselves. For many nations, this is a major, difficult, but necessary reform.

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THE NATIONAL VENTURE CAPITAL ASSOCIATION

TESTIMONY

BEFORE THE

JOINT ECONOMIC COMMITTEE

OF THE

U.S. CONGRESS

AUGUST 28, 1984

SUNNYVALE, CALIFORNIA

Presented by:

Frank Caufield
Kleiner, Perkins, Caufield & Byers

Franklin P. Johnson
Asset Management Company

Burton J. McMurtry
Technology Venture Investors

The National Venture Capital Association has 176 member companies and was formed to create a broader understanding of the importance of venture capital to the United States economy.

It also works to stimulate the free flow of capital to young companies.

I wish to submit a prepared statement on behalf of the Association that explains venture capital, its vital role in the economy, and the impact certain tax policies have on the availability of capital to entrepreneurial companies and the ability of those companies to attract the talent needed to manage dynamic growth.

In the short period I have to testify I will attempt to summarize the more lengthly prepared statement.

Venture capital is the business of developing businesses.

The key to this process is the entrepreneur, or business person who starts his or her own company. Venture capital assists the entrepreneur with the money and expertise to make that company a success.

Most venture capital money comes from venture capital firms. These generally are private partnerships or closely held corporations funded by venture capitalists themselves, insurance companies, endowment funds, pension funds, bank trust departments, corporations, wealthy individuals and foreign investors.

PROFESSIONAL VENTURE CAPITAL ORGANIZATIONS INVESTED $2.8 BILLION IN 1983 TO LAUNCH NEW BUSINESSES AND FINANCE GROWTH OF YOUNG COMPANIES.

BUT MORE IMPORTANTLY, THESE COMPANIES:

- CREATE AN UNUSUALLY LARGE NUMBER OF NEW JOBS AND EMPLOYMENT OPPORTUNITIES.
- IMPROVE LIVING STANDARDS THROUGH ACCELERATED APPLICATIONS OF NEW TECHNOLOGY.
- IMPROVE THE PRODUCTIVITY OF ALL INDUSTRY.
- CREATE PRESSURE ON ESTABLISHED COMPANIES TO INNOVATE AND BE PRICE COMPETITIVE.
- GENERATE SIGNIFICANT NEW TAX REVENUES.

THESE FIVE ACTIVITIES HAVE A VITAL BEARING ON THE OVERALL AMERICAN ECONOMY AND CANNOT BE OVEREMPHASIZED.

LET ME ELABORATE.

A STUDY BY THE GENERAL ACCOUNTING OFFICE IN 1982 LOOKED AT 72 COMPANIES THAT HAD BEEN FOUNDED WITH VENTURE CAPITAL FUNDS DURING THE 1970'S.

DESPITE THE FACT THAT ONLY $209 MILLION WAS INVESTED TO START THE FIRMS, THE STUDY FOUND THAT BY THE END OF THE DECADE: "THEIR COMBINED SALES IN 1979 ALONE TOTALLED $6 BILLION. GROWTH IN ANNUAL SALES AVERAGED 33 PERCENT A YEAR AND, IN THE PROCESS, THESE FIRMS CREATED AN ESTIMATED 130,000 JOBS, OVER $100 MILLION IN EMPLOYEE TAX REVENUES AND $900 MILLION IN EXPORT SALES."

CONTRASTED WITH THIS GROWTH AND PRODUCTIVITY, IT SHOULD BE NOTED, BETWEEN 1977 AND 1982, FORTUNE 1,000 COMPANIES LOST 1.5 MILLION JOBS.

ANOTHER STUDY BY THE AMERICAN ELECTRONICS ASSOCIATION ALSO SHOWS THE VITAL CONTRIBUTION VENTURE CAPITAL PLAYS IN OUR ECONOMY.

THE STUDY EXAMINED 77 COMPANIES THAT HAD BEEN FOUNDED WITH VENTURE CAPITAL BETWEEN 1971 AND 1975. IT FOUND THAT IN 1976, FOR EVERY $100 IN EQUITY CAPITAL THAT HAD BEEN INVESTED, THERE WERE $70 IN EXPORT SALES, $33 SPENT ON RESEARCH AND DEVELOPMENT, $15 IN CORPORATE INCOME TAXES, $5 IN STATE AND LOCAL TAXES AND $15 IN PERSONAL INCOME TAXES FROM JOBS CREATED BY THE INVESTMENT.

VENTURE CAPITAL IS LONG-TERM INVESTMENT WITH ACTIVE INVOLVEMENT TO BUILD MAJOR BUSINESSES IN ORDER TO REALIZE CAPITAL APPRECIATION.

WHILE STOCK MARKET INVESTMENTS ARE EVALUATED MONTHLY, QUARTERLY OR YEARLY AND EMPHASIZE SHORT-TERM GAIN, THE TYPICAL TIME FRAME FROM VENTURE CAPITAL COMPANY START-UP UNTIL THE VENTURE CAPITALIST SELLS HIS INVESTMENT IS SEVEN TO 10 YEARS.

GENERALLY VENTURE CAPITALISTS SELL THEIR INVESTMENT THROUGH AN INITIAL PUBLIC STOCK OFFERING, OR IPO, BY THE COMPANY OR THROUGH THE COMPANY'S MERGER WITH OR ACQUISITION BY ANOTHER COMPANY.

UNTIL THIS HAPPENS, HOWEVER, THE VENTURE CAPITALIST HAS AN EXTREMELY ILLIQUID INVESTMENT AND ONE THAT WILL REMAIN SO FOR A LONG TIME.

FEDERAL TAX AND FISCAL POLICY HAVE AN INCREDIBLY DRAMATIC EFFECT ON THE VENTURE CAPITAL INDUSTRY, WHICH IS WHY I'M HERE TODAY.

WE BELIEVE THERE ARE TWO ISSUES THAT CRITICALLY AFFECT WHETHER VENTURE CAPITAL CAN CONTINUE TO PLAY ITS VITAL ROLE IN THE AMERICAN ECONOMY CREATING JOBS, INCREASING PRODUCTIVITY AND MAINTAINING THIS COUNTRY'S TECHNOLOGICAL LEADERSHIP. WE WOULD LIKE TO PLACE THOSE TWO ISSUES BEFORE YOU AND URGE YOUR SUPPORT OF THEM.

THE FIRST OF THESE ISSUES IS CAPITAL GAINS.

THE DIFFERENCE BETWEEN THE TAX RATES ON CAPITAL GAINS AND PERSONAL service income directly affects the growing availability of funds to the venture capital industry for investment in new, emerging companies.

Let us briefly look at the history.

Beginning in 1969, Congress gradually increased the long-term capital gain tax rate so that by 1977, the maximum rate stood at just more than 49 percent. In addition, Congress had reduced the maximum tax on personal service income from 70 percent to 50 percent. Because both taxes were virtually identical, there was little incentive to risk investing in young and growing companies.

In 1978 that trend was reversed, however, as the capital gains rate was reduced to 28 percent. A further reduction to 20 percent was enacted in 1981.

The capital gains rate reductions of 1978 and 1981 and the subsequent increase in the difference between the tax on capital gains and the tax on personal service income dramatically encouraged investment funds for the development of new, small businesses.

It is this differential that provides the incentive to investors in venture capital firms to take risks and invest in new, emerging companies. It is this differential that makes it attractive for investors to take the risk of investing in the initial public offerings of these emerging companies and provide the larger amounts of capital needed in their dynamic growth phase rather than invest in more secure income oriented securities.

Misguided tax policy in the 1970's had two deleterious effects.

First, it made the after tax returns in high capital appreciation oriented risk investments the same as in low risk income oriented investments, THUS SERIOUSLY IMPACTING THE ACCESS TO THE INITIAL PUBLIC OFFERING MARKET FOR EMERGING COMPANIES AND THEIR VALUATIONS IN THE MARKET. SECOND, IT DRIED UP THE AVAILABILITY OF FUNDS TO THE VENTURE CAPITAL INDUSTRY AND THEREFORE TO NEW AND YOUNG PRIVATE COMPANIES BECAUSE THE RISK REWARD RATIO WAS SIGNIFICANTLY LESS ATTRACTIVE AND THE HIGH RATES LOCKED UP INVESTMENT CAPITAL IN OLDER MORE MATURE INVESTMENTS. THE IMPACT OF TAXING HIGH RISK CAPITAL GAIN ORIENTED INVESTMENTS AT THE SAME RATE AS MORE SECURE INVESTMENTS REDUCES THE DEMAND FOR THOSE INVESTMENTS AND THEREFORE THE PRICES AT EVERY LEVEL IN THE PROCESS. THIS MULTIPLE IMPACT OF LOWER DEMAND, LOWER PRICES, LOWER RETURNS AND HIGH TAXATION OF ANY GAINS DEVESTATED THE INDUSTRY IN THE 1970'S.

IN 1975, AT THE BOTTOM, THE TOTAL NEW PRIVATE CAPITAL COMMITTED TO VENTURE CAPITAL FIRMS WAS JUST $10 MILLION AND THERE WERE ONLY 4 UNDERWRITINGS OF FIRMS WITH A NET WORTH OF $5 MILLION OR LESS AND ONLY $16 MILLION WAS RAISED FOR THOSE COMPANIES. SINCE IT REQUIRES CAPITAL TO GROW, THE PRICE PAID IN FOREGONE JOBS, USEFUL PRODUCTS, EXPORTS, AND TAXES PAID WAS A VERY HIGH PENALTY FOR TAX POLICIES THAT WERE SET WITHOUT CONSIDERATION OF THEIR IMPACT ON THIS CRITICAL ELEMENT OF THE ECONOMY.

IN CONTRAST, IN 1978, THE YEAR AFTER THE FIRST CAPITAL GAINS REDUCTION, THE CAPITAL COMMITTED TO VENTURE CAPITAL FIRMS INCREASED TO $570 MILLION AND WITH THE MORE FAVORABLE TAX ENVIRONMENT HAS CONTINUED TO INCREASE EVERY YEAR SINCE TO $4.1 BILLION IN 1983. THE PUBLIC UNDERWRITINGS OF SMALL COMPANIES HAS ALSO SHOWN SIGNIFICANT GROWTH TO OVER $3.6 BILLION IN 1983.

THE MORE ENLIGHTENED TAX POLICY HAS RESULTED IN THE MOST DYNAMIC PERIOD IN THE HISTORY OF THE VENTURE CAPITAL INDUSTRY AND THE PROMISE IS A LARGE PAYOFF IN JOBS, TAXES, BENEFICAL PRODUCTS, EXPORTS, AND INNOVATIVE COMPETITION. HOWEVER, THIS WILL ONLY CONTINUE IF TAX POLICY CONTINUES FAVORABLE AND IN THE VIEW OF THE NVCA THAT MEANS LOW CAPITAL GAINS RATES AND A DIFFERENTIAL RATE TO REWARD RISK TAKING.

LEGISLATIVE EFFORTS IN THE CAPITAL GAINS AREA ARE CRITICAL TO FURTHER INCREASE RISK-TAKING AND THEREBY PROVIDE MORE DOLLARS FOR START-UP COMPANIES AND YOUNG, HIGH-GROWTH, JOB-PRODUCING INDEPENDENT BUSINESSES.

MOST IMPORTANT IS THAT WE MAINTAIN OR INCREASE THE CURRENT DIFFERENTIAL THAT EXISTS BETWEEN THE CAPITAL GAINS TAX RATE AND THAT FOR PERSONAL SERVICE INCOME.

WHETHER WE MAINTAIN OR INCREASE THIS DIFFERENCE WILL DETERMINE WHETHER WE MAINTAIN A FAVORABLE INVESTMENT CLIMATE AND ENCOURAGE THE LONG-TERM, RISK-TAKING INVESTMENT THAT SUSTAINS YOUNG AND GROWING COMPANIES.

I WOULD NOW LIKE TO ADDRESS THE SECOND ISSUE OF VITAL IMPORTANCE TO THE VENTURE CAPITAL INDUSTRY -- INCENTIVE STOCK OPTIONS (ISOs) -- AND ASK YOUR SUPPORT.

INCENTIVE STOCK OPTIONS ARE CRITICAL TO THE VENTURE CAPITAL INDUSTRY. SUCH OPTIONS HAVE THREE BENEFICIAL EFFECTS: NEW AND EMERGING COMPANIES UNABLE TO PAY LARGE SALARIES CAN ATTRACT TALENTED PEOPLE; COMPANIES ARE MANAGED FOR THE LONG TERM; EMPLOYEES HAVE INCENTIVES TO PERFORM THEIR JOBS BETTER AND MAKE THEIR COMPANIES MORE PRODUCTIVE.

CONGRESS HAS LONG RECOGNIZED THE IMPORTANCE OF ALLOWING EMPLOYEES TO own a piece of the company. It has enacted legislation permitting employee stock option plans (ESOPs), employee stock purchase plans, and qualified and restricted stock option programs.

The key requirement in developing new companies into major enterprises is the building of management teams. The opportunity to create an after tax net worth is the major attraction that will cause capable managers to leave secure positions to join fragile new emerging companies. The capital gains opportunity afforded by Incentive Stock Options has been a principle recruiting tool.

Unfortunately, there are three serious drawbacks with the current ISO legislation.

The first drawback is that the law included the spread between exercise price and fair market value as a tax preference item, which is used in calculating the alternative minimum tax.

This means that someone receiving options can be subject to 20 percent tax on a paper profit at the time of exercise.

And that means that a person can be subject to a double tax -- the paper profit at time of exercise and the capital gains tax at time of sale.

In addition, he also is paying a 20 percent tax on what could turn out to be a capital loss.

He also has to pay the tax when he invests in the company, not when he realizes cash from the sale.

The second drawback is that an employee can be granted only options which have a fair market value of $100,000 or less in any one year.

This serves as a artificial and arbitrary cap on incentive.

Finally, options must be exercised in the sequential order in which they are granted.

This severely diminishes the value of the option, particularly if the exercise price of options granted earlier exceeds the current fair market value of the stock of ISOs granted later have a lower exercise price.

To help a broad-based work force realize the American dream of owning a "piece of the action," businesses in all spectrums of growth and development -- emerging, high-growth or more mature, stable companies -- should be able to grant stock options that don't penalize the employee.

We therefore would recommend three actions.

The first is to amend Section 57 ([illegible]) of the code to eliminate as a tax preference item the "spread" income that exists when an option is exercised.

The second is to amend Section 442A [illegible] of the Internal Revenue Code to remove the $100,000 annual ceiling on ISOs.

In conclusion, we at the National Venture Capital Association believe that action in the two areas of capital gains and incentive stock options -- by helping the most dynamic segment of our economy -- can provide more jobs, productivity and better maintain America as the world's technology leader.

I appreciate the opportunity to present the foregoing information to you.

Representative LUNGREN. Thank you.

Mr. JOHNSON. What we plan to do is to take the questions that you posed one at a time. We did gang up and met earlier this week and decided each to take a question as the primary answerer with each, obviously, being able to chime in. And we'll do that in some good order and then have discussion after that, if that's suitable for the committee.

Representative LUNGREN. That's fine.

Mr. JOHNSON. Well, I'm going to tackle the first one, which is: What is venture capital financing and how does it differ from other forms of business financing?

We believe and I believe that venture capital financing is the investment of money and talent and effort into companies where there's a substantial risk that all the capital could be lost, but where there is a belief that if the company is successful you can make a substantial gain. And another feature of venture capital investing is you're investing in liquid situations for a long period of time, which makes it different from most other kinds of investing.

We almost always invest in some form of equity, that is, some kind of stock, so that the money is permanent. It's not lent to the companies, it becomes part of their permanent capital. And we become partial owners of these businesses. And in an emotional and intellectual sense, we become coventurers. Our frame of mind is that we are coventurers with the entrepreneurs. We are not the entrepreneurs, we are not normally the one that thinks up the idea or has the stroke of insight that causes the entrepreneurial idea to occur.

But we concur with it and once we are in a company we do feel very much like coventurers and we try to develop that kind of a spirit in the people in which we invest.

Other forms of business financing usually involve a lot less risk. There is less personal involvement with the company and the rates of return are often lower because the risk levels and the amount of investment of time and effort as well as money is lower. I think those are the essential definitions and descriptions of what we do.

One modification is that we often, or sometimes I should say, actually help form the companies and we take a part in the entrepreneurial act itself. There are some examples of that where venture firms have actually had ideas and assembled the talent and the money and the organization to launch a new business. But normally we are backers of other people's ideas.

I think that's it. Frank, do you want to comment on the first one or do you want to tackle No. 2?

Mr. CAUFIELD. I think I'll just go into the second question, which is: What existing Federal policies are the most effective in increasing the supply of venture capital?

I approach this question with a little temerity, not because it's difficult but out of fear of beating it to absolute death. We'll go once again into the capital gains rate and the importance of low capital gains rates. Even the most reluctant cannot fail to notice that when you lower the rate more money comes into the venture capital business; when you raise the rate the money dries up. And that is reasonably accepted.

The fact that venture capital investment is an efficient way to produce jobs, tax revenue is also accepted, albeit by some with some reluctance. But, again, how far to sort or preach to the converted, I hope, or to belabor this subject is unclear to me.

I think it's also important to focus not only on the rate of capital gains tax but on a differential between an ordinary income and a capital gains rate. A slightly more subtle point, but I think to provide more incentive for capital to take more risks it's clear and important that that distinction remain.

And I think that it's probably a question for an economist, not for me, but you could at least make the case that the differential is as important as the rate. And I think in the thrust toward a simplification of the Tax Code and a flattening of rates and a broadening of the base, I think this could be one of the real important casualties of that thrust if it happens.

Going further, I think that incentive stock options are clearly an existing policy which does help the flow of venture capital, but clearly it helps some but it doesn't help nearly as much as it could and should. You've heard from the previous panelists on this, and I really have very little to add to what you've heard previous to this.

A point to make about Federal tax policy that I think perhaps didn't get sufficient emphasis is that a lower Federal capital gains tax rate not only increases the amount of venture capital but it also increases the number of entrepreneurs. These people make the same calculations that the investors do. They see what they can make and how much they can keep when it's all over.

So the fact that money came into the venture capital business, the other part of the equation was it didn't just stay in the venture capital business. It went out to form companies and these companies were led by groups of entrepreneurs and they wouldn't have been there, or wouldn't have been there in those numbers if it hadn't been likewise for the lowering of capital gains taxes. That's it.

Representative ZSCHAU. Congressman, I have a question that I'd like to follow up with Frank. And that is: We've seen a dramatic outpouring of the venture capital as a result of the capital grains tax being reduced, first from nearly 50 percent to 28 percent and then again in 1981 down to 20 percent. The question arises: Should the capital gains tax be reduced still further or is it about right now given the differential between ordinary income?

And if indeed you feel that the capital gains tax should be reduced still further, how much lower and what kind of impact do you think that it might have?

Mr. CAUFIELD. Well, there's obviously a lot of difference of opinion in our industry on this. My personal opinion is that the rate need not be lowered. It's hard to make the case that there's a shortage of venture capital now. I think from a practical point of view, if you lower it you would just make from possible to probable to close to certain the fact that there will be a reaction and it will be jacked up somewhere, and you don't know where it will stop.

I think in tax policy that not only fairness but the appearance of fairness and equity are crucial. I think a capital gains tax that would be lower than it is now or nonexistent would fail that test.

So my own feeling is that that would be unadvisable and unnecessary on several grounds.

Representative **Zschau**. Is there any other comment on that?

Mr. **Johnson**. Well, I just would say that I agree with Frank as to practicality. If there were a rollover provision where you could change investments without paying capital gains tax but devote the proceeds in some period of time to reinvestment that would be helpful. The problem with reducing capital gains taxes to zero is that all that money can be converted then into consumption, and the fairness issue then does get raised of having essentially tax-free.

My favorite project, which I won't go into, would be to have consumption taxes as the fundamental means of taxation and investment and savings is not taxed until it's pulled out of that cycle for consumption. I don't think this is the hearing for that, however.

But the only modification I would make is a practical matter without a complete change in the Tax Code, and that would be a rollover provision. It would encourage the liquidity and the flow of money from one investment to the other.

Representative **Zschau**. There seems to be a sense that the situation with venture capital is that it's just about right now. In the 1970's there was only a small amount of venture capital being put into funds—it got as low as $10 million, I believe, in 1 year in the mid-1970's. Then shortly after the capital gains tax was lowered in 1978 about a billion and, as I understand it, last year over $4 billion.

Is $4 billion enough, too much, or what about $8 billion or $10 billion? What's your sense? Maybe that's one of the questions you were asked to answer. But I think it's an important question. Are we at a perfect point right now, or should we be trying to find ways to encourage still more venture capital investments?

Mr. **McMurtry**. Let me comment on two questions, if I may. First of all, concerning potential reduction or further reductions of the capital gains tax, I think from a practical point of view and a political point of view that is not something that is likely to be in the cards. On the other hand, I would hope that in the pressure to increase taxes that we don't succumb to the pressure to nudge them up and begin the trend of increasing capital gains taxes.

I think the interpretation by the investment community of a trend to run the capital gains taxes back up would be a very strong interpretation and could be exceedingly negative. And I think from a theoretical point of view I think we might be quite surprised at the positive benefits of further reductions in the capital gains tax.

But as a political realist that is not something that we are strongly advocating.

Representative **Lungren**. Let me interject a question there, Do you have any doubt in your mind that if we increased the capital gains tax we would see a proportionate drying up of capital investment?

Mr. **McMurtry**. I don't have any question about that. I can't prove it, but I have a very strong impression that it would.

Mr. **Johnson**. But the relationships over the years in the late 1960's to the 1970's and 1980's are about as clearcut an economic experiment as you—there are other factors because we don't have a test tube.

Representative LUNGREN. So we don't need to repeat the experiment?

Mr. MCMURTRY. No, sir.

Mr. JOHNSON. I don't think so. Especially since we think we know the results and the cost of experiment would be very tough.

Representative LUNGREN. Not only from a financial standpoint, but just as importantly if not more importantly from a jobs standpoint.

Mr. MCMURTRY. Jobs. Absolutely.

Mr. JOHNSON. One point that we should emphasize at this point in the discussion is that it is not just the invested money that dries up, but the entrepreneurs themselves have less incentive to leave good jobs if there's less differential between ordinary income returns and the capital gains. One of the big incentives, although there are many others having to do with lifestyle and freedom of action, is that you can generate a capital gain from a modest investment if you're the entrepreneur as well.

And so I think Burt pointed out very ably, what we really want to do is promote entrepreneurship. Venture capital is merely one of the facilitating elements for entrepreneurship, and a very important one. But there are six or seven others that we'll probably get to in the course of our discussion. But the key is getting entrepreneurs to form companies and increasing capital gains taxes would be a direct disincentive to that.

Mr. MCMURTRY. Ed, let me comment also on your question about the amount of venture capital. Is the amount of venture capital about right? There are some people in the industry who say there's too much money around and others who say there's really not enough. I'm amazed. One of the specific questions that the panel has here is: Is there too much money chasing too few deals, too few investment opportunities? I think it's a very important question.

In 1980 when so much new money began flowing in we were starting our new partnership and I wouldn't have believed that there would be the number of new business opportunities to really accommodate all that money. And it turned out that I was being really quite shortsighted because entrepreneurs are among the smartest people in this country and in the world.

And if capital is relatively hard to come by, as it was during most of the 1970's, then only the diehard entrepreneurs set out to start companies. I mean, they're really sort of the lunatic fringe of entrepreneurs are out there starting companies. But when capital becomes really readily available then entrepreneurs say, "Well, now it's worth the risk to go to this."

And the quality and quantity of investment opportunities that we've seen has just increased absolutely dramatically and I would have believed that it could occur. Now, is there too much money or is there just about enough money?

At times I get irritated at how much money there is and how much competition there is in the business now, compared to, frankly, the relatively noncompetitive environment in most of the 1970's. But I pass that over very quickly because I am so strongly in favor of a tremendous supply of capital.

Let me tell you a couple of reasons why. One I've already described, and that is with this great flow of capital stimulated by the capital gains tax reduction entrepreneurs have come out of the woodwork. That is tremendously good and let's just focus on the job creation and the tax paying benefits of those businesses and those individuals with jobs.

A second factor, and I think it's very important, is related to this question. There's a lot of money around, let's suppose there's $8 billion available in a couple of years, which would be lovely. Well, many of our friends in the venture business who've been in the business and many of our new venture capitalists come to Silicon Valley because they want to invest in all these Silicon Valley companies.

Well, what they begin to find is that, "Boy, there are a lot of venture capitalists in Silicon Valley already and they're really sort of already very much in the flow of investment opportunities and it's sort of hard to find the good opportunities in Silicon Valley". And so what do you do when you've got a lot of money and a certain area appears to be sort of locked-out. In other words, it's hard to penetrate this area because so many of the investment opportunities are taken by the local well-established people.

You do a very obvious thing. You say, "Well, now where else in the country are circumstances likely to permit another Silicon Valley?" And you as an investor become aggressive about going to those areas. And you go to Oregon and you go to Colorado and you go to Washington and you go to Phoenix. And I'm speaking of our case in the Western United States focus.

But you go all over the country and you take some initiative and you say, "We're in the venture capital business, does anybody around here like to start companies?" And you participate in seminars and you talk with Government officials and you talk with people in local industry. And I believe there are tremendously positive benefits.

I think the supply of venture capital in the country is still very small. One way to look at it is: The total venture capital pool is still only a fraction of the R&D budget of the IMB Corp., the total supply.

Mr. JOHNSON. One number is that about $30 billion a year goes into starting new businesses in the United States, according to some numbers I read from an MIT study. So if $4 billion is coming into venture capital it's certainly a small portion of the total money. This is starting of bars and restaurants and every small business and every kind of entrepreneurial activity.

Most of the venture capital goes into starting companies in high-growth areas, that's where the rates of return are. But it's a small part of the capital required by new and young businesses whose job production performance is well-established.

So it's not a large amount of money compared either to the size of our economy or to the size of money needed by new business.

Mr. McMURTRY. I think one of the best things that can be done to stimulate Silicon Valleys in other parts of the country is to maintain a vibrant venture capital climate and let the free market work. Namely, let people with that capital go find entrepreneurs in whom to invest. And I think it will get that capital much more geographically disbursed that it presently is. I think that's healthy.

Representative **Lungren**. That leads us into the third question—I know they want to get along here and make sure we can cover most of it—which is: What new Federal policies would be most helpful in further expanding the pool of venture capital funds?

You've indicated maintaining the environment for venture capitalists, but I suppose the question is: What things should we do to maintain it and to expand it?

Mr. **McMurtry**. Let me respond to that.

I would agree with a number of the comments that were made this morning about what should be done. I believe the Government sponsorship of research is critically important and Government support to educational institutions. We are really critically dependent upon this supply of talented and trained people.

I think also such things as the extension of the R&D tax credit are important. I think that more mature U.S. industry has typically underinvested in continuing development. I think that anything the Government can do to stimulate additional research and development investment is really an extremely important thing to do. And as an example, the extension of the R&D tax credit.

I think providing a climate in which management incentives are readily available—I think if we could possibly clean up some of the mess in the incentive stock option area having to do with the cap and the sequential exercise and, in my view, particularly the Preference Tax treatment of it we would in fact have made some inroads in that same area.

And I would only add to that maintaining low capital gains tax rates and, I believe, maintaining a differential in those rates compared to ordinary income. Beyond that I don't think there's a lot that needs to be done in the way of Government policy.

Mr. **Johnson**. One thing I would think would be very helpful is to have stable policy for several years. We're investing for a long time. We're putting money to work now that we will not see liquid for 5, 6, 7 years in most cases.

Representative **Lungren**. You've got enough risk to worry about without the Government giving you more?

Mr. **Johnson**. That's right, and I know you're a bipartisan committee from both Houses, but it would be important, I think, for the Congress to pull itself together in the sense of uniting to the best you can the various sides of the House and Senate so that a national policy can be kind of agreed upon so that the investors and entrepreneurs can say, "This is the way the country is going to be for a while." That would be a very great help as well.

Representative **MacKay**. I'm interested in your views of whether this field is—or whether entrepreneurship risk-taking and innovation is affected at all by actions at the State and local level, or whether it's strictly free market with the Federal policies that are conducive and let it work it's—in other words, more and more States are adopting in effect industrial policies to try to stimulate growth.

Do these make a lot of sense?

Mr. **Caufield**. Well, I think the State and local policies that have the most effect are local policies that have to do with zoning requirements. When you're putting up a new semiconductor facility and it costs $20 million and it sits there for 8 weeks while the plumbing inspector decides whether you can turn on the water or not.

So those things—I think now as this kind of business becomes, you know, more clearly important to the local economy I think those kinds of government entities are becoming more responsive. California has recently eliminated capital gains tax for certain kinds of investment in small businesses.

Those moves are typically made, I would guess, in the motivation to be competitive vis-a-vis other parts of the country. And they're important, they help. But in a weight sense I think the Federal Government's policies are overwhelmingly more important.

Mr. JOHNSON. One principal one, I think, is the support for public education that's been a State job. It's, of course, heavily influenced at the research university level by the Federal Government. But we should talk very briefly about the California State educational system, and I mean very briefly.

But the Silicon Valley was partly created because of the presence of two major research universities in the area, Stanford, and the University of California, the latter being a State function. And the strength of the entire University of California has been a big factor in the growth of technology in our State.

But we have to also look to the State colleges, which, while not being research institutions, some of them have very fine engineering schools. And the journeymen engineers and some of the top engineers of many of our companies are graduates of Cal State Northridge and San Jose State. And then beyond that level the community colleges, of which there are over 100 in this State, are tremendous—particularly the local ones—in training the technicians and paraprofessionals that really flesh out the companies.

So in looking at the educational background of Silicon Valley, it has played a vital role. Not the only role, as was pointed out by Jim Treybig. But the community colleges and the State colleges and the support of public education which has been strong in California historically, with a few dips, has been a vital factor in the growth of our entrepreneurial climate here.

Mr. McMURTRY. I think it is.

Let me comment on the State issue for a moment, if I may. A number of States, as you know, have instituted policies in which they are, for example, setting up organizations to do direct investing in venture capital and providing lots of other incentives for young technology businesses to enter those States.

I personally am reasonably skeptical about the likely success of the direct investment programs. I hope that they will be successful. I mean, I don't care where the venture capital comes from. I'd like to see it, I hope it will be successful. But the history of venture capital investing by very large corporations, by State institutions and so forth is not a particularly good one.

It turns out that this business is such a long-term business and it is frankly such a frightening business—I mean, it can look so bad for so long as you get into your investment. And one of my truisms practically is that almost every startup we do becomes a turnaround at some point. I mean, it gets into so much trouble that you really have great grief.

And large, necessarily bureaucratic organizations really have a great deal of difficulty being patient for the 5, 6, 7, 10 years of maturing and further refinancing of companies and so on that needs to be done. They also have great difficulty in cutting losses.

And one of the critical elements in the venture capital business is that you must permit failure. Not every company that you start should succeed. I mean, it's terrible for the people involved to keep beating their heads against the wall in a way that will never be productive. And so you must permit failure.

And again, in larger bureaucratic organizations failure is often not permitted because it can be hidden by supplying additional capital and making it appear that the business is doing fine. And so I'm not sanguine about the direct investing, although I hope it works and I hope that the people that are doing it will in fact take very, very long-term views toward it.

But I think the major thing that could be done is State support of education and State tax policies that encourage investment.

Representative LUNGREN. Maybe all three of you can help us with the next question, which is one that we've been hitting at for the last couple of days. But I think it's really an intriguing one, and that's why the Silicon Valley has been such a fertile ground for venture capitalists.

You've heard the previous panel give us some ideas of why they think we've got startup companies and so on. We would be very interested to find out, particularly Mr. Johnson, who has had experience in the Chicago area—the comment was made in the previous panel that Chicago has outstanding educational institutions, there's no doubt about it. It's got water, just like we have very close here in the bay. It's got a little different weather. And it also has people that have been involved in investment for many, many years. There was already an infrastructure of investment, although perhaps more identified with the old smokestack industries than out here.

And the question intrigues me. Why have we been so successful here and they have not been so successful in those areas of the company? But in a more positive vein, why is Silicon Valley such a fertile ground for venture capitalists?

Mr. JOHNSON. Well, just to say one comment about that, they were very successful in the technologies of their time: The thermodynamics and the things that made the steel industry possible and the cutting and bending and welding of steel and manufacturing technologies which evolved around the turn of the century. Chicago, for instance, had its day in the Sun and will, I'm sure, emerge again because they're working very hard on this problem.

But we're in one of many bursts of technology that this country has had. This happens to be the electronic-information one, and it happens to have been centered here. But people could have been looking at Chicago at 1900 and said, "Why is it all going on there, why isn't it happening in Buffalo or somewhere?"

So we're looking at new problems, and I wouldn't even be surprised if there were panels of Congressmen assembled in those days to wonder why Chicago and Pittsburgh were getting all the new steel mills.

But in looking at Silicon Valley briefly, one point has to be made. There's a long history here going back into the 1920's of electronic development. There were three firms in the 1920's I know of, one was called Bessie Electronics that made crystal sets—not Bessie Electronics, it was Bessie Radio, there were no electronics to it. Lee DeForest settled in Palo Alto and developed an early vacuum tube that was very fundamental to technology. And McKay Radio, which still operates here under some other name, was one of the first international wireless transmission companies. Those were all electrical-electronic types of companies and began in the 1920's.

Throughout the 1930's, as our chart shows, there were a few people that did venture capital, particularly a man named Edward Heller got going in the 1930's and backed some young companies. And Hewlett-Packard began in the late 1930's. And I think the emergence just after World War II of two or three major firms—I would name Hewlett-Packard in particular and Varian as another and Ampex—this sort of a core group of companies grew up that not only demonstrated that their backers had made money and the entrepreneurs had made money, but they began to develop a kind of a—of course, infrastructure is the word—but a bunch of service industries that went around them so that the ground was fertile here.

There were investors here who understood technology and electronics. There were companies to service them. There were community colleges and universities training people to work in these industries. They themselves were the trainers of entrepreneurs who left those companies.

So I would say it became a kind of a critical mass phenomenon that became large enough in the post-World War II years and in the 1950's edged along so that it was natural that with Stanford and its electronic training and research and with all the other institutions, this whole thing came together and enough interaction occurred between all of these elements to create a rapidly growing place that attracted venture capital, that attracted people moving here, there were trained people in marketing because of business schools and the emphasis, there were people getting experience in other companies.

So we had a critical mass develop and a kind of an explosion, kind of a Florentine explosion if you want to use that kind of analogy. This has happened over the world and many times. It happened in Pittsburgh and Chicago, as I said earlier. It happened here now and we're going to work hard to keep it going as long as possible.

It's not a new thing exactly, but it's our age's version of the flowering of a tremendous amount of technology and culture in a certain place. I think that's really what happened here and it could only happen really in the United States because of the kind of atmosphere we have.

We have an atmosphere, not only in Silicon Valley but in the United States, that makes heroes and it respects people who take that kind of risk, who may fail. But you're not castigated if you fail with a good try. Here you get another chance.

Art Lasch, whom I've backed and has been backed by others and who testified before you, has had several successes and some things that didn't work out so well. But he's formed several companies and has done very well several times. He is a good example of the denizens of Silicon Valley who try and keep going.

And I would just suggest that there is an emotion and a climate here that supports entrepreneurship, and that is true in our country in general. And Silicon Valley, or some version of it, will happen all over the country as capital flows from here to other places and flows from the other centers of finance to communities which foster entrepreneurship.

I do think that States and local governments can, by working on it and welcoming businesses and encouraging and calling on businesses to form around their communities, those have had some effect. It certainly had the effect around San Antonio and Dallas and Austin, and they've worked very hard in North Carolina to form the research triangle. Those things will eventually succeed in my belief.

But Silicon Valley occurred because of a long history of small activity that rapidly grew then in the post-World War II years so that all the services that were required to make entrepreneurship flourish did occur together in the period of the 1960's and the 1970's.

Mr. McMurtry. Let me mention a couple of other factors that I think occurred. One is that, for example, at Stanford University there was from the late 1930's a very positive attitude toward a lot of interaction between university professors and local industry. That is not something that you find in a lot of areas.

In a lot of areas, the universities really are quite insular and consider that anything having to do with people who make products is somehow beneath them. And there has been a tremendous positive blending, I think, of talent from universities and a lot of university people who are heavily involved in helping to start companies and work with those companies and then take that useful information back to the universities.

I think there's also a factor that related to the creation of this infrastructure, the number of support organizations around, that relates to a question this morning. And that is: What's the impact of the defense industry?

You know, the Silicon Valley has had substantial investment by the Federal Government in defense businesses. And I believe that it has had some impact. And one of the reasons it's had an impact is that it has provided support for a fairly large base of highly technically trained people, many of whom are going to these same universities.

I, for example, came out here to work at Sylvania, which was primarily doing defense business, and had the opportunity to go to Stanford University while I was working under a program that had been worked out between Stanford and local industry, You know, the founders of ROLM Corp., three of the four founders of ROLM, had worked for GTE-Sylvania, largely in the defense business. And the fourth I tried to hire, but he went to IBM instead.

So I think the defense industry has had some impact. It has not been overpowering but it has been very positive in helping to provide a supply of very well-trained people and in helping to provide a supply of support industries to electronics-type businesses.

A final comment in this area: One important question for all of us, really, is how long is it going to take to reproduce Silicon valleys? I mean, if we say that Silicon Valley sort of developed over the last 30 or 40 years, you know, are we forced to the conclusion that we must wait for that period of time?

And my reaction is: Absolutely not. And I think we see that happening, Silicon valleys developing in other areas. And let me get back to the impact of the venture capital business. I think if we have a tremendously strong and vibrant venture capital climate and we have venture capitalists taking an active role in seeking out investment opportunities in new parts of the country, that alone can be helpful in accelerating the process.

Entrepreneurship is so much more an excepted way of life, as it was described in the earlier panel, that I think it again makes it more of a national phenomenon; it is more acceptable to think about starting a small company or going to work for a small company now than it was even 5 or 6 years ago.

So I don't think we're going to have to wait anything like the gestation period that we've had in Silicon Valley.

Representative LUNGREN. So I assume, with respect to the question about the paucity of venture capital activity in some regions and should that be a matter of Federal Government concern, you would say generically if we create an environment that allows entrepreneurial activity and venture capitalism to flourish those things will take care of themselves as the market system works?

Mr. MCMURTRY. I think absolutely it will.

Representative LUNGREN. And I guess one of my questions is—you know, you say it can happen somewhere else. It did happen here and you've gone into a number of reasons why it happened here.

Apparently, one of the reasons was that mobility was either highly regarded or not something to look down on in terms of jobs here.

Mr. MCMURTRY. Yes.

Representative LUNGREN. You say it's happened in other parts of the country and so forth, but people leaving jobs in other parts of the country didn't tend to look upon that as a great adventure. It was "get involved with a company that's well-established so you have that job for a long period of time."

Here the idea of being in a place for a long time doesn't seem to be the measure of whether you're successful or not.

Mr. MCMURTRY. Uh-huh.

Representative LUNGREN. I don't want to overstate it, but in some ways it may indicate that you weren't as venturesome and your potential for success would not be as great, therefore.

Mr. MCMURTRY. Yes.

Mr. JOHNSON. Mobility in America, as compared to other countries, is very great.

Representative LUNGREN. Sure.

Mr. **Johnson**. Even throughout the country people move all over the country going where the jobs are, and have for many, many decades.

Representative **Lungren**. But following World War II, up until the last decade, California was notable for it.

Mr. **Johnson**. Yes, sir.

Representative **Lungren**. There weren't very many of us that were natives of California. Everybody was from somewhere else.

Mr. **Johnson**. That includes me. As a matter of fact, I was born in Illinois.

But even the history of the Dallas areas goes back into World War II, so that you have some long threads of technology. But I would agree with Burt that it doesn't have to take 30 years, just a matter of a few key companies—perhaps even branches of companies—giving a community or a group of communities a series of plants and employees who are technically trained and who can form the cadre for a new entrepreneurship.

One of the most important things, I think, about the Government not being too active in the investment area is that you can practically start any business you can think up in the United States if you can find someone else you can convince it's good. And there's no single committee or single-point source you have to go to.

There's many, many sources and if you can just sell somebody on your idea you can try it. The marketplace will tell you a lot about whether you were right or wrong. But at least you get to try it.

That differs vastly from, well, the situation in Europe and is one of the reasons why I believe these State-oriented investment programs will have much of an effect. They will tend to back things that the guys on that committee buy. But what you need is a chance to sell your idea to dozens of places.

Representative **MacKay**. Congressman, I'd like to go back to what Mr. McMurtry was saying. It would appear to me that it would be in the public interest to have, if there was any error, an error on the side of an oversupply of venture capital. Since typically the entrepreneur may have great sophistication in the technical skills but none at all in the ability to raise capital.

And it would be better to have a situation where the venture capitalists are competing and are out looking. If it's in the public interest to stimilate innovation, it would seem to me that it would be very much in the interest to have you people and your counterparts having to literally scour the country to see if there are good ideas, where people have got the ideas but really are discouraged because of a lack of an ability to find capital.

Mr. **McMurtry**. Absolutely no question about that. And in specific examples, I've done a lot of investing in Colorado in the Boulder/Denver area in the last decade and that's certainly a burgeoning area. I've talked with a lot of people in other areas—you know, the Phoenix area and Oregon and Washington—and it's amazing how naive the entrepreneurs typically are. They really almost don't know how to present themselves, don't know what questions to ask, they're a little defensive, they wonder if you're going to take advantage of them.

And you really have to work with them to have them understand how this process works. Whereas in this area the entrepreneurs are very sophisticated. Because what's the first thing they do when they think about starting a company? They look around and they say: "Do I know anyone that started a company?" And they call that person or call someone to whom they're referred and they say: "How did you do this and with whom can you deal, and how do you get this going?"

It's a process that needs to get started, and again, I think if the venture climate is positive just as you say, the venture capitalists will do some of the education that can help stimulate the growth and help compress the cycle over which that has to occur.

Mr. CAUFIELD. Let me make one comment on that.

I think the nut of this is that capital in this country is extremely mobile and that there are venture capitalists from Boston and New York who are out here all the time. My partnership has investments in Boston, Chicago, Houston, southern California, Portland, Colorado. So we go all over the country and, you know, we find people—sort of unwelcome visitors from other parts of the country—right here in our backyard.

So another phenomenon that we've seen is that California partnerships have started affiliates or branches in different parts of the country: Atlanta, Dallas, Colorado to name a few. So I think this thing that you find desirable—and I agree—is in fact virtually the case.

I think if there is an opportunity the capital generally is available. The reason there is a paucity of venture capital in an absolute sense in various regions of the country is that there's not that great a demand for it. Many of the venture capitalists typically are required in situations that have extremely high growth. Because you're taking cash and you're turning it into inventory, you're turning it into receivables, and so you need money to grow fast.

But many of the new businesses, the majority of the new businesses that are started, inherently take a certain amount of capital but then are generally self-funding and don't require venture capital. And also don't confront the kinds of problems that we are used to helping entrepreneurs with.

So I'm not sure that the paucity of venture capital in some parts of the region, to the extent that's in fact the case, is really a problem.

Representative LUNGREN. What Federal programs are the most important in increasing the flow of ideas that attract venture capital financing is really not the question of Federal programs that assist you in the actual financing, but rather that increase the flow of ideas that might attract you to finance those ideas in a practical or commercial sense.

Mr. MCMURTRY. I think that gets back directly to the combination of support for education and research and encouragement of research and development in existing industry. I think those are the major areas, coupled with the incentives, continuing incentives for investment and continuing incentives for management and employees of those companies.

Representative LUNGREN. In thinking about investing in a new venture would the fact that that venture somehow was relying on an idea that was generated by a Government lab affect your decision one way or the other?

Mr. McMurtry. Not particularly. It depends really on the quality of the idea. I've actually had some exposure to the Government Laboratory Program and I applaud that program. I think the gestation period will be long for that, but it's a very healthy one because I think there are some good ideas that will come out of the Government laboratories.

Representative Lungren. And obviously it's not the cornerstone of the whole effort——

Mr. McMurtry. No.

Representative Lungren [continuing]. But it just appalls me to find out who is getting the information from those labs. And if there are some ideas they're generating that are worth dealing with, maybe some people in the private sector ought to be taking a little harder look at what's out there.

Mr. McMurtry. Well, I think you get back to a supply and demand situation. If we really continue to have a vibrant venture capital climate and have—let's suppose we arrive at a situation where there's just too much money fishing around Silicon Valley for deals and people have to go look elsewhere and they discover these Government laboratory programs. You might find some venture capitalists who suddenly get very interested in trying to capitalize on those Government-funded activities.

The gestation period may take a while but I think it will happen. The capital is highly mobile, is looking for good ideas, and I think that the source of those ideas is almost immaterial. The critical element is the people. The critical element is, you know, who are the people that can really pull this off.

And one of the difficulties in the Government Laboratory Program is that very often some of the people who are most knowledgeable about a piece of technology that might be available from a Government laboratory really legitimately want to remain with the Government laboratory doing research in new areas.

And so you've got to find some entrepreneurial technical person who is willing to come in and learn enough about that business to say: "OK, now I want to go take this off and make a business out of it." And adding that step in the process generally adds a lot of time and a lot of risk.

Representative Lungren. That's an important point. I assume if we started losing these people from the Government labs in this process we'd defeat the mission of the Government labs because we'd lose their expertise to do the essential mission of those labs.

Mr. Johnson. We don't really invest in technological ideas—Burt started to build up on that, I just want to follow up—we invest in business ideas, which involve markets. And I think all of us agree on a kind of a slogan: We look at people first and markets second and the technology third.

Because there have to be terrific people involved, they have to see a place in the marketplace, we have to believe they can carry that off. And the technology, which is vital sometimes because the change in market or the opportunity won't be there without the technology, is only one of the components.

So we don't invest in technological ideas, we invest in entrepreneurs who have a marketplace in mind for some technology that they've learned about or that they've developed.

Representative LUNGREN. Well, maybe that leads us into the next question which goes to the issue of the extent that venture capital markets fund productivity-enhancing innovations for already-existing industries, versus startup activities.

Mr. CAUFIELD. Well, I estimate that between one-third to one-half of all investments that we made go to fund companies that intend to produce products that will enhance the productivity of existing industries. I give as an example a robotic system with vision for automobile assembly that would be sold to General Motors. Or a factory automation system that would be sold to a semiconductor manufacturer. Or computer-controlled equipment for a process industry. Or a new kind of drying machine for a paper industry that would increase the throughput of the paper machine.

So I would say that probably the biggest single component of investments that we make—and I don't think that our partnership is any different from Pitch's or Burt's—go into that kind of a field.

And I think there's a related point that is easy to miss and very important, and that is that some of the most important things that these small companies do is not so much what they do but what they goad large companies into doing. Because I think it's safe to say that IBM would not be half the company that it is today if it hadn't had smaller companies starting up generating a product that IBM felt compelled to respond to in order to generate a better product, more competitive product, cheaper product, faster.

And you see this all the time. I mean, a company called Home Health Care of America pioneered a new way of delivering health care to people in their homes. But the biggest impact of this was probably the fact that within a few years Baxter-Travanaugh, American Hospital Supply, and Abbott Laboratories were in the market. Or some of the biotechnology companies.

Well, they've had an impact. But now you have Eli Lilly in there. So I think you goad—you increase the productivity of these companies not only by selling them a piece of automated test equipment that they couldn't develop but which enables them to process seven times as many wafers per hour, but you also goad them into responding, half because they need to respond with a new product to stay competitive, half because of their ego. They are slightly offended that some small company would have the temerity to leapfrog them technologically. So it goads them.

And it also is an extremely important part of those large companies to stay internationally competitive. Because competing with other smaller U.S. companies clearly makes them competitive against the Mitsubishis of the world.

Representative LUNGREN. Can you teach entrepreneurial skills? Are business schools doing the job of teaching those things that you folks look for in entrepreneurs when you're seeking the investment? It's one of the questions we prepared for you folks, but it's also a question—most of the people that appeared before us that have been involved in these startup companies apparently didn't go to business schools to get their training. Most of them got technical education or got into it some other way.

Is that the best way to do it, or can we, in fact, transfer those skills by teaching?

Mr. McMurtry. We have a very biased responder to that question.

Representative Lungren. Well, I know we have a teacher here.

Mr. Johnson. I think the graduate schools of business, which is the segment that I can speak a little bit about, all have entrepreneurship courses and they all have small business management courses, they're almost inseparable.

At Stanford there are two entrepreneurship courses, one is called small business management and the other one is called forming a new venture. The one I teach is about formation. So we talk about—I'd call it—the prenatal period, and perhaps even the moment of conception.

But that other course talks about running a young company. There is a tremendous interest in entrepreneurship courses. I was also on a committee at Harvard Business School to talk about curriculum for the future in the entrepreneurial area. Harvard itself is changing its curriculum to put many more small business cases in the basic courses of finance and control and production.

I would think that an emphasis by the business schools on operating jobs, operating kinds of courses, interest in the students that goes away from consulting and investment banking toward operating jobs in small business is really the key to it. Entrepreneurship is taught because the students want it, the market is there for that.

Most people at start companies around here have primarily technical training. They're dependent on other people on the team. So what we do normally invest in is a group of people and not just one person. One of those persons often is an MBA.

The single most lacking skill in entrepreneurial startups is marketing. Among all other skills, that's the one that is most often poorly performed.

So the answer to your question is that business schools are improving the job they are doing in teaching entrepreneurship because they are directing effort toward it. To teach someone what it's like to be a startup with the uncertainty and the panic and the disappointment and the surges of success and the whole emotional side of it is very difficult.

We try to re-create that in business schools with cases and with guest speakers, as well, who tell us what it's like, both from the entrepreneurial and venture capital segments. Jimmy Treybig is the star of our class every year when he tells what it was like to get his company going. But you can't really create it until you do it.

But business schools are changing and they're doing a better job of interesting people in operating jobs in small business and in entrepreneurial activity itself.

I think I'd stop with that, because it's a changing thing and they're meeting the demands of the students and providing leadership as well. Now, those are your name graduate schools of business. Community colleges, State colleges, the entire educational system, though, have courses in marketing now, there are courses in entrepreneurship, and there's an interest throughout business training, whether it's in MBA programs or not.

And so it's very easy, for instance, in California for a young entrepreneur if he has time, or she, to go off in the evening and take a course in accounting or in marketing at the the community colleges and many, many people do that.

Mr. **Caufield**. Just one short comment to elaborate on that.

I think business schools can and are doing an increasingly better job of teaching entrepreneurial skills. I think acquiring an entrepreneurial attitude is quite something else and I think that's formed long before you hit business school, in my opinion. And I think that the people who select the courses have the attitude already, but I don't think you're going to do a lot to teach the kind of attitude that's really a kind of risk-preference attitude toward life, which is really the much more key ingredient to the process.

Representative **Lungren**. Congressman MacKay.

Representative **MacKay**. Congressman Lungren, I want to ask this panel a question that I've asked previous panels. To some panels I've asked the question in a way that was constructive and to others I seem to have managed almost to set the stage so we couldn't discuss it constructively.

So let me start out and say that I'm an entrepreneur, I'm a risk-taker, there are some risks in our business. Before I got into politics I was a risk-taker. I'm in the citrus business and my groves froze last year and I don't have any government subsidies. So I'm a free market guy, although I'm a Democrat.

I wouldn't be here if I didn't think that this area carries the key to the future of the country. There 's a controversial issue that's coming up this next year and we tend to look at it in a way that finesses the gut question. We are going to go toward a tax structure that attempts to broaden the base and reduce the brackets, and that's a free market idea.

And a lot of people who have been saying, "That's what we want," have not really thought through the surprise endings that come when they discover that some of their incentives are, in fact, loopholes. And Mr. Sanders yesterday said. "Give me a reduced bracket and forget the incentives."

This morning the comment was: We don't even want to think about that because that's somewhere off in the future; we want to save the incentives we've got.

Now, you all are less subjectively involved in these issues and I would suspect more objective and are looking at it more on a policy basis. If we do that, what part of the current incentive structure do you think is critical and what part is not?

I expect next year there will be a discussion in which everybody in America comes forward and says, "Yes, we want a flat rate, but don't bother my incentive."

Mr. **Caufield**. When you talk about incentive are you referring specifically to the R&D tax credit or——

Representative **MacKay**. I consider the R&D tax credit to be one, I consider the capital gains to be one, and I consider everyone of these that's going to be on the table this next year.

Mr. **Caufield**. Well clearly, as I say, again, you'll probably get three different responses here. But capital gains on a macroeconomic basis would be extraordinarily important. And both its rate and its differential between ordinary income, I think, could —to the extent that goes, it's clearly a more inviting target because it can produce more—at least in the short term or at least on a fairly static analysis—bring more revenue for the Treasury.

Representative **Lungren**. But only on a static analysis.

Mr. **Caufield**. Only on a static analysis.

But on the other hand, I think, for example, the R&D tax credit, to the extent that the overall corporate tax rate was lower and therefore there were more retained earnings and therefore there was more money available out of a general corporate pool that could be put into R&D, I think that the loss of that credit wouldn't be a major blow.

I think clearly as it stands now, at the margin—I think it really depends on the farsightedness and the capabilities of the managements involved. I myself think that most managements would, given that the overall take of the Federal Government out of their revenue was the same—to the extent that they have the same amount of revenue available and they chose to allocate it differently, that would simply mean that they were misallocating it before.

So I think at the margin it could have a small effect, but I don't think it would be very important.

Representative **MacKay**. My own impression, based on some studies that have been done within the last year, is that the R&D tax credit, although it was of great importance in this segment of the high tech area, was probably abused as much as anything that we've done. And the study seemed to indicate that everybody just reclassified stuff they were already doing as R&D. And the Treasury has now got a mess on its hands trying to figure what really happened.

Is there a way that we could focus it more? Maybe I should have asked that question.

Mr. **Caufield**. Well, that's a technical issue that involves a lot of accountants with very sharp pencils and a lot of people looking over their shoulders checking to see what their sharp pencils were doing.

Representative **Lungren**. And a lot of billable hours.

Mr. **Caufield**. Right. And so I——

Representative **MacKay**. That may be one of the things that we would be better not to——

Mr. **Caufield**. Well, my comment wasn't to say the R&D tax credit was bad. I said that, given a certain tax structure and something that would encourage R&D I think is in fact good. I'm hypothesizing, though, that under your assumption there is going to be a change, but the net tax take out of a corporation is the same, then I don't think it should be if you assume that the R&D—well, I guess the danger would be that you're going to allocate R&D funds to marketing expenses, or travel, entertainment, or dividends.

Then I think if you do that when you have the chance, then that's a management issue and the management's not doing the right thing, if they were doing the right thing before.

Mr. **McMurtry**. [illegible] me comment on that, if I may.

I personally am [illegible] fan of tax simplification. It's hard to find someone who is not a great fan of tax simplification.

Representative **MacKay**. In theory.

Mr. **McMurtry**. In theory, exactly, and I think lowered rates and more simple tax structures would in fact be tremendously healthy. For example, in business I think it would permit and encourage business managers to make more rational business decisions and competitive decisions that would be less dependent on what the specific tax structure is or is not.

Representative **MacKay**. Analogous somewhat to what deregulation has done.

Mr. **McMurtry**. Yes.

Representative **MacKay**. Because it takes away the game playing and forces everybody to get on with the business of operating the business.

Mr. **McMurtry**. I think that's right. I have really wrestled with myself and with a number of my colleagues, and a number of us in the National Venture Capital Association talked about this at length. I would love to be able to wrestle myself to the ground and say that I really am for a great tax simplification to the extent that capital gains taxes need not be differentiated from other taxes. I think that's an ultimate simplification.

But if I'm not willing to do that, if I believe that there should be a differential, then I sound like everyone else who says: "Well, I want it simple except for this particular area." I have wrestled that hard.

But I honestly believe that we would make a very serious error by not having a differential between the tax rate on investment and the tax rate on ordinary income. I may be wrong, but I very strongly believe that we would make a serious error if we did not preserve some differential if there needs to be. I don't know, but I honestly think we would be giving a very bad signal if we did not have the differential.

I wish I had a different feeling about that, and yet I don't. I mean, I have a very strong feeling that the differential is exceedingly important.

Representative **Lungren**. Let me jump in here just for a moment.

It's extremely important that we hear this because there are various proposals moving toward a flat tax, that is simplified. We're all moving in that direction and there's a major one, Bradley-Gephardt. Some of the rest of us on the other side of the aisle have the Kemp-Kasten—we call it the Kemp-Lungren-Kasten in my area—fast tax.

One of the major differences among those is that some preserve capital gains and others do not. And it's very important for us to focus on that in terms of what it means for the active high-growth strategy that I believe everybody wants to have. The question is, How do you properly construct that?

Mr. **Johnson**. I was going to say, if Bradley-Gephardt were passed, say, as it's been submitted, the rate on taxes would be 30 percent. That would mean the capital gains tax included would rise from 20 to 30 percent and would not be different at all.

I would say in that specific case there would be a very strong break on the flow of invested money in the capital venture process and there would be a break on the desirability of starting your own business compared to staying and working for somebody else. I'm certain that would happen as much as you can be in any economic prediction.

I think that trying to separate out investment income as something that's different from the income that we get from our labors is tough, but it is a different kind of animal. And I think the fact that we convert investment income into consumption very easily is part of the problem. I think we have to take—if we're going to really attack it—we either have to have a rollover tax so that if you reinvest it there is very little tax consequence, or have a complete tax system that says investment income is one kind of animal, and as long as you don't extract money to spend on cars and going to the beach then it's not taxed at all, or taxed very low.

So I think that by calling investment income as the same kind of thing as we get from what is loosely called earned income, the fact that we sort of put them all in one pot and then differentiated them—I think they are different and they should be taxed differently because they are not the same thing.

One other point I want to make quickly, and that is that—and I made it earlier—but if you do put capital gains taxes up, you inhibit the changing of investments, you inhibit the liquidity of the country because people are loathe to sell the stock so they put it in a new one. That's true at the stock market investor's level and it's true at the venture capital level as well.

And I think you want to encourage liquidity and money from venture capital investments flowing out of them at some point and back into new venture investments. High capital gains taxes would inhibit that process, it would inhibit the formation of new business.

Representative MacKay. Congressman Lungren, if I might just—I want to be sure I understand what you say. Alice Rivlin has got a proposal that shocked a number of people because they thought she would come out very liberal on this and she came out in a way that appears to be conservative.

And she was saying in essence that you could do the same thing as the capital gains differential if you allow this rollover mechanism. It would provide the same kind of incentive. In other words, she's trying to build a tax structure that is an income tax but it is imposed at the point when you convert it from investment to consumption.

Mr. Johnson. That would be—without going into detail—the kind of thing I like. But as a practical matter I think that there will be some legislation passed next year. And it is my belief, and the belief of my colleagues, that if it does not preserve a strong debt differential and keep the capital gains taxes low, the effects will be very much like what happened in the 1970's when, in 1969, the capital gains taxes were raised.

They were kept low under Kennedy; they were raised under Nixon—surprisingly enough—and then lowered again under Jimmy Carter and finally under President Reagan. So it hasn't been—there are reasons that happened, of course—but it hasn't been exactly a kind of a Democratic-Republican thing. It's just that public policy has gone those ways during those periods.

I think, though, as a practical matter, that we will not have the kind of radical change that would say that all investment income is untaxed and that until you convert it to consumption it's taxed. That would be terrific. People would get very wealthy but they couldn't spend it, and that might be fine.

Representative **MacKay**. It's kind of a different way of thinking about it. But it would make us more competitive. If you assume we are now in an international marketplace and that some of what we've got is archaic because it's built on the assumption that all competition we have to worry about is interior to the United States then you've got to look at what our competition is doing.

And in fact they're getting dramatically different and more effective results because of tax policy. And one of them is that we tax consumption, we don't tax investment. And America has been very ambiguous in its view.

Mr. **Johnson**. As a matter of fact, you go down to the high taxed European companies—Sweden, France—you'll find very low or zero capital gains taxes. They have different rules about what is a capital gain. But, say, Australia has a very low capital gains tax but very high income taxes.

They want people to invest and make things happen from an investment point of view. That would be a very long discussion within the Halls of Congress if that gets going.

Mr. **Caufield**. Well, I think, though, in general it's probably safe to say that you would find little argument with that general thrust among us—in our industry. I think that—well, I'll just stop with that.

Representative **Lungren**. Well, you have been very generous with your time. We're just about out of time now. I just wondered if any of you had anything else to add? Prior to that let me just thank you again. It's been most interesting and I think you've been most helpful in our inquiry.

We're trying to look at a number of different perspectives on the Silicon Valley phenomenon and the Route 128 phenomenon.

Mr. **McMurtry**. We want to thank you, and indicate that if we can be of any further assistance to you please don't hesitate to let us know.

Representative **Lungren**. Again, thank you very much.

[Whereupon, at 12 noon, the committee adjourned, subject to the call of the Chair.]

[The following articles were subsequently supplied for the record:]

Government Research and Growth in Silicon Valley

by Peter J. Jesella

Congressman Zschau has given me this opportunity to express my reaction to this concern of what keeps Silicon Valley going. One factor that keeps this valley a research and development wonder to the world is innovation. Innovation may occur through a combination of entreperneurship and funding for the critical initial basic and developmental research . If there is to be any form of National Industrial Policy it should directed towards generating more knowledge in the broad area of initial basic and developmental research.

"In January 1980, the National Aeronautics & Space Administration (NASA) entered into a joint venture agreement with the California Council, American Institute of Architects/Foundation (CCAIA/F) and Pacific Gas & Electric Company (PG&E) to fund, plan, design, fabricate, and assemble a single family dwelling which would display application of advanced technology and architectural concepts from NASA and other sources applied to residential design and fabrication. The long term purpose was to inspire innovation and future development in home design and construction by exposing members of the housing design professions, the building industry, manufacturers of building products, and the general public to the potential in innovative, advanced technology and residential design."

-----Advanced Technology House, Final Report Draft, June 1, 1981
-----Unpublished

The goal of the ATECH Project was to research, develop, and accelerate new technologies combining them into a integrated unit providing energy selfreliance for a family. It seemed very appropriate that Moffiet Field was chosen as the location. This being the famous Silicon Valley were ideas and entrepreneurship have worked to make home computers affordable and useful. Herbert Holley was the overall project director with an experience of being director for the recovery systems on Mercury, Gemini and Apollo spacecraft. Mr. Holley, "This program will be looking at adapting the technologies developed in the space program. The public has provided them and should receive the benefit."

This challenge would not be the first time that NASA would be working on a housing energy efficiency project or attempting to use sensors in a house feeding information into a computer. A Tech House was designed and built by NASA at Langley Research Center in Hampton, Virginia being completed in 1976.

Many of the computer developments occuring in the last few years have occured in this valley. This made AMES Research an ideal location for the basic research and development of a advance technology modular house with a fully integrated computer system operating various subsystems in the house. NASA has developed the internal structure that can most readily collect information on the 'leding edge' of innovation occuring across the country and some of the best people to evaluate and combine different products into a demonstrable working unit.

By June of 1981 it was clear that all funding by NASA on the ATECH Project had been eliminated and the project was cancelled by all participants. Katherine Wasserman was the project director representing CCAIA/F and responsable for the architectural design. Ms. Wasserman spent six months after this drop in funding attempting to persuade many of the corporate leaders of many electronic firms here in Silicon Valley to help restablish this program. Unfortunatly these officials did not want to become invested in areas outside their specific field of development, being computers, and taking on energy and housing developments. Even if the heart of the project was the development of a home computer that was fully integrated into the household linking and monitoring other household functions, requiring numerous peripheral equipment and software, these computer companies had little experience or desire in building a integrated house around a "home computer".

The role of government in one sense is to provide seed money for the growth of a large scale industry. The difficulty is making decisions on when after millions, and maybe billions of federal dollars have been spent in "seed money" for a particular area outside the constitutional duties does the funding stop. Does the billions spent continue to grow, remain the same, or actually decline. An example is the current controversy over the future deletion of funding for the space shuttle project and the eventual owenership and responsibility for the production, development and operation of a space shuttle by a none federal agency. To a greator degree the production of a space shuttle is already in the hands of private industry, NASA will always exist as a agency and play a role in the development of space vehicles. The area of struggle currently is in the funding transition for operations, which is probably in the billions of dollars.

This is only one general example of many government programs that have grown from " a joint project to fund, plan, design, fabricate, and assemble" a space vehicle "which would display application of advanced technology and" engineering "concepts from NASA and other sources applied to" transportation, exploration, and commerce to low altitude outer space. In a symbolic sense both the space shuttle and the Advance Technology Housing Project (ATECH) had the same goals of research, development and demonstration. Unfortunatly the space shuttle project continues to grow into a multi-billion dollar project and the ATECH project has no funding at all. The bumpersticker label for this occurance is our current version of National Industrial Policy.

To gain the true benefits of a home computer a research and development alliance needs to be established between the housing and computer industry. NASA with the ATECH Project was working on the basic research to help bridge the gap between these two industries, to prove to both industries that with current technology on the market we could make a new generation of housing for the American family.

Only when government takes action to perform the basic research will entrepreneurs be able to take that knowledge and develop it into a commercial product. Current industry will only stand on the sidelines because of all the investment capital that has been commited to the current product. But if we entrepreneurs are to be able to develop this new market we need the government, like NASA, to be able to do the basic research that the large industries decline to do. We fear the innovational and manufacturing qualities of the Japanese. Well the Japanese have already established the billions needed to mass produce and market a cheap modular house. "Six Sekisui House factories throughout Japan resemble those automated automotive marvels operated by Nissan (Datsun), Mitsubishi and Toyota. A robotized assembly line 440 yards long can crank out one basic dwelling unit every four minutes. Example: Misawa Homes, Japan sold 30,000 homes last year, including a new ceramic house. It's 30 percent cheaper to produce than conventional Japanese homes and is made from a nearly inexhaustible resource - sand. Misawa spends big dollars for research. Kataoka said that's one reason why Japanese companies out-produce American firms. In the United States, the typical home builder does fewer than a dozen homes a year, usually has limited capital and can't afford to spend money on research or development."

---Knight-Ridder News Service, San Jose Mercury News
---Saturday, February 12, 1983, Page 8E

If we are to keep up with this challenge from Japan the Federal government will again need to establish funding for the research and demonstration of a ATECH House. With such a program in progress then maybe we will see an alliance in this valley or another valley between the computer industry and the housing industry.

Again I would like to thank Congressman Zschau for the chance to present this information to the Congress, members of the Silicon Valley, and the public.

——Peter P. Jesella 8/28/84

Motivational Needs in Entrepreneurial Organizations

by E. Bruce Peters
Consultant, International Socio-Technical Systems

ABSTRACT

This paper highlights two different motivational profiles, that of the entrepreneur and that of the manager. It then suggests that a transition in managment style is required if an entrepreneurial organization grows and develops. Application of this knowledge can be of value to entrepreneurs and others such as venture capitalists.

MOTIVATIONAL PROFILE OF AN ENTREPRENEUR

Of the many human needs which have been identified and desribed, three are particularly important in explaining a person's conduct in an organization. These three are achievement (nAch), power (nPow), and affiliation (nAff). Psychological studies show us that the need for achievement is particularly strong in successful entrepreneurs, to the virtual exclusion of the other two.

There is a cluster of observable behaviors which is evidence of this need. They are concern with a standard of excellence, moderate risk taking, energetic activity, a desire for individual responsibility, a requirement for prompt feedback, and anticipation of future possibilities. [1]

Standard of Excellence

Entrepreneurs are "bores. They are not artistically sensitive. They're always trying to improve themselves or find a shorter route to the office or a faster way of reading their mail." [2] This example shows they want to do things in a new or better way. The standard they set is their own, not easily influenced by others. They don't start off by wanting to get rich. They simply want to do something well. [3] For example, as a teenager, Soichiro Honda, founder of Honda Motors, was simply trying to improve the nose on a statue of Buddha in a neighbor's garden when he accidentally chiselled it off. [4]

Moderate Risk Taking

In the eyes of the entrepreneur, the risks he is taking are moderate, always somewhere around a 50% probability of success. At this risk level, personal efforts can make the difference between success and failure. Success is a result of skill and decisiveness, not chance.

Others may feel the risks are too great and have a fear of failure. The fact that the entrepreneur sees the risks as manageable also means that he has a great deal of self confidence. One entrepreneur states: "Since I was a little boy, there was nothing I thought I couldn't do. I liked to bite off more than I could supposedly chew and then succeed." Another comments: "I remember thinking, Jesus, we're never going to make it." But he adds: "All you think about at night is not what we're going to do if we don't make it, but how we're going to succeed." [3]

Energetic Activity

The entrepreneur tries to avoid work. That's why he's always looking for a more efficient way to do things.

However, he does work harder when there is a chance that personal efforts will make a difference in the outcome. He does not work harder when winning is probable, but only when there is some challenge in the situation or some chance of losing. He does not work harder at routine tasks but only at tasks which require originality or a new approach.

He does not necessarily have to work only for himself, for he can work as a member of a group. But he must be free to develop courses of action, initiate action, and make decisions concerning what is to be done. He does not do well if told what to do, think, or believe. [1]

These characteristics explain the strong bias towards action and legendary hard work of the entrepreneur when these conditions are met. They also explain his frustration in a highly structured organization.

Nolan Bushnell founded Atari with a bankroll of $500. He says, "The critical ingredient is getting off your ass and doing something. It's as simple as that. A lot of people have ideas, but there are few who decide to so something about them now. Not tomorrow. Not next week. But today. They start working on that idea today."

Jeno Paulucci, founder of Chun King and later Jeno's Pizza, says, "Then he has to have the guts and determination to sacrifice.... I mean no five-day forty hour week stuff." And he still insists on working seven days a week. [5]

Individual Responsibility

The entrepreneur wants credit for success and accepts the blame for failure. It's a hands-on approach to management. He wants to be involved in everything that's going on and try to make it happen.

Gene Amdahl, founder of Amdahl Corporation and then Trilogy, recalls, "I do like the excitement of starting a company and operating it. What I don't like is the environment of a bureaucracy, like when I left IBM." [6]

As another example, An Wang of Wang Laboratories personally designed everything the company sold for a long time, and he still likes to spend about half his time in the lab. He gave up a New York Stock Exchange listing to keep full control. [7]

Feedback - Knowledge of Results

The entrepreneur looks for positive and definite feedback concerning task accomplishment. He is not motivated by money and what it will buy; money is simply a handy means of keeping score. In fact, incentives based primarily on money may even lower performance. Long after financial security is attained, he will keep working - as already noted in the case of Jeno Paulucci - and risk large sums in further expansion. [1]

Even though he strongly endorses the goal of profitability for his company, Ben Wang of Wangco - no relation to An Wang of Wang Laboratories - says, "Making money is not my concern at all. It's the personal accomplishment. I could have drifted into teaching with a PhD degree and done research. But what do you do in research? Publish papers, right? What gives me satisfaction is that I see what I created. Tape drives are being used everywhere. I enjoy seeing something accomplished, seeing the company I formed growing into a good company."

In 1974, acknowledging personal worth of about $3 million, he continues, "I don't even figure my money. I still live the same way I lived before, and I don't worry about money. I really enjoy my company and my work. This is my whole life, just to see the company grow and do well. That's my major enjoyment."

Female Entrepreneurs

With approximately one-third of new businesses being started by women today, the question arises as to how they differ from other women and from male entrepreneurs. First, they were probably strongly influenced by their entrepreneurial father who imparted a feeling of independence. One woman states, "I was my father's oldest son. He gave me lots of responsibility; he didn't want me to grow up dependent on a husband like my mother."

Contrary to male attitudes, women generally liked school and regret they didn't take more business courses. In many cases, they enjoyed working for others.

They are comparable to men in attitudes toward risk. They also share a high divorce rate due to time and effort spent on the business. [9]

Other Characteristics

The entrepreneur will try to anticipate future possibilities by considering alternatives and consequences before they occur. He prefers experts over friends, someone who can help solve the problem rather than someone he knows and likes. [1]

MOTIVATIONAL PROFILE OF THE MANAGER

In contrast to the entrepreneur, the effective professional manager is motivated primarily by a need for power (nPow). While the need for power frequently has a bad connotation in our society, the expression of power considered here is not the personal, tyrannical, authoritarian form summarized by the comment of one woman bureaucrat in Washington who commented, "I like to crack the whip every once in a while just to see them jump."

There are numerous facets of the power motive as well as its relation to affiliation beyond the scope of this paper. The aspect of power motivation considered here is the one which appears most effective in an organizational context.

This is the more socialized form of power exhibited by the manager who has self control. Instead of causing subordinates to feel meek and submissive, he makes them feel strong and responsible. He does not force people to do things but helps them figure out ways of getting the job done better. He rewards people for good performance. He organizes the work so that subordinates know what they should be doing. He fosters team spirit and pride.

As an individual, he joins more organizations and feels considerable responsibility for building them. He is elected to more offices. He likes to work as it satisfies his need for getting things done in an orderly way. He has a keen sense of justice. He is willing to sacrifice some self interest for the welfare of the organization. He controls his drinking and has a strong feeling of service to others.

Other characteristics are that he is more mature - less egotistic. He is more willing to seek advice from experts. He has a longer range view and fewer personal prestige possessions. He seems older and wiser. [10]

His approach could be summarized as follows:

> Here are goals which are true and right, which we share. Here is how we can reach them. You are strong and capable. You can accomplish these goals. [11]

John Sculley, who moved from PepsiCo to Apple Computer, seems to epitomize this type of power behavior. He says, "I'm more a professor than a professional manager. My job has been more coaching than doing it all myself. My technique is to get people to do great things."

He reorganized Apple into two divisions to achieve greater clarity of objectives. He developed loyalty and teamwork. One employee states, "People didn't feel he was imposing something from outside. You felt he was trying to make us all win....He says 'Think really, really big.' " [12]

Need for Transition

By now it is clear that there is a distinct difference in motivational patterns between an entrepreneur and a professional manager. While it may be an over-simplification, the essential differences can perhaps best be summaraized in this way. The entrepreneur seeks the thrill of personal accomplishment and wants feedback on how he's doing. The manager wants to influence and energize others; he doesn't require the same kind of prompt feedback concerning the results of his actions.

This means that at some point, as an entrepreneurial organization grows and develops, there must be a change in managerial style. Eventually, the entrepreneur will no longer be able to lead solely by the force of personal example and personal achievement.

Unfortunately, it appears that with few exceptions such as David Packard of Hewlett Packard, the entrepreneur is not able to make a change in personal style. Further, he does not want to give up any authority in the organization he has created, his child. Examples abound.

John Sculley's move to Apple Computer to introduce organizational changes has already been cited. Another entrepreneurial manager states in recognition of the need for a different style, "The thing is, I know the place won't run the way it would if I was in charge."

New executives in another firm described the change in style they introduced in this way, "We have open management. We get a lot of input into major decisions." [13]

Paul MacReady, the father of human powered flight -- the Gossamer Condor, founded AeroEnvironment. After many difficulties, he was forced to accept a former Naval officer as CEO. The new CEO then relieved him of managerial reponsibilities. MacReady now states, "I'm delighted I can shuck responsibility on anyone who can do the job." [14]

Data General Corporation's founder and president, Edson deCastro, recognized the need to bring in outside managers after a period of declining profits. Data General has now turned around. [15]

These examples aside, many entrepreneurs state, "It just wasn't fun any more," and then move on to form another company. In other cases, control is given up only in a very reluctant manner. Another entrepreneur states, "It got to the point where I couldn't do it all. The business couldn't grow unless I let my managers make decisions on their own." [13] Only then did he consent to give up some control.

Implications

A number of implications result from this analysis of personal motivation at different stages of organizational development and growth. First, the entrepreneur requires an extremely high need for achievement to be successful. The level of this need in any individual can be assessed through psychological tests such as the Thematic Apperception Test. A would-be entrepreneur should seek to know himself. A low score should certainly be cause to reconsider.

Likewise, venture capitalists or others considering investing in a new venture could improve their odds by including a formal assessment of motivation as a part of their screening process. While venture capitalists place considerable emphasis on evaluating the management of potential investments, most of their evaluation seems to be based on "gut feel."

A more objective evaluation can provide the same type of quantitative data concerning motivation as those used in evaluating the financial and marketing aspects of potential investments.

Another possibility is that of developing entrepreneurial motivation through training. This type of training could potentially do far more for economic development than dependency producing hand-outs. If only a portion of aid to minority and disadvantaged groups or developing countries were to take this form, there would be an explosion of economic growth. [16]

Similarly, since the publication of the book In Search of Excellence, many organization leaders proclaim the need for entrepreneurs within their organizations, or as they are now called, intrapreneurs. If they are willing to provide an environment suitable to entrepreneurial activity, if they can, in fact, accept the disruptive, chaotic, tumultuous, unstructured nature of innovation, motivational assessment of their people can aid in selecting the most likely intrapreneurs. Motivational training can then reinforce the motivation.

Although An Wang of Wang Laboratories recognized the need for professional management only recently after many years of growth and successful operation, the need for transition in managment style seems to arise most frequently in a one to three period after start-up. Of course, this assumes initial success and growth of the organization.

Again, venture capitalists seem to recognize intuitively that this happens without quite knowing why. The information provided here can provide a better understanding and prevent surprise. Assessing motivation can make it possible to determine whether or not a transition in management will be required. Training in power motivation may help avoid what might otherwise be a painful transition.

Finally, the most likely case, recognition of motivational patterns and the need for a change in management style can lead to a planned and orderly transition.

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A ROUTE 128 PERSPECTIVE

THURSDAY, AUGUST 30, 1984

Congress of the United States,
Joint Economic Committee,
Washington, DC.

The committee met, pursuant to notice, at 9 a.m., in the Gardner Auditorium of the Massachusetts State House, Boston, MA, Hon. Daniel E. Lungren (member of the committee) presiding.

Present: Representative Lungren.

Also present: Robert Premus, professional staff member.

OPENING STATEMENT OF REPRESENTATIVE LUNGREN, PRESIDING (PANEL 1)

Representative **Lungren**. The committee will come to order for hearings on the Route 128 phenomenon.

As you may know, we started these hearings in Washington a couple of weeks ago, we have had 2 days of hearings, in Silicon Valley, and now we are here in Route 128, referred to as "America's Technology Highway" and sometimes referred to as the "Golden Semicircle." There is no doubt it has become recognized as a world center of high-technology development.

Only a quarter of a century ago, to many, the Massachusetts economy had a bleak future. Most of us from other parts of the country thought of textile jobs when we thought of Massachusetts and we thought of the concern about those jobs being lost to the South and to other nations. Many hundreds of thousands of New Englanders were thrown out of what were secure jobs and faced an uncertain future. There is no doubt that Massachusetts had one of the highest unemployment rates in the Nation at that time.

Few people recognized that the technological diversification of the Massachusetts economy that was to come would provide an attractive alternative growth scenario for the region. The New England economy was fortunate to be blessed with a vibrant entrepreneurial community that led to the extraordinary success of the Route 128 corridor, and today Massachusetts has established itself as a world leader in technological innovation and as a State with the lowest rate of unemployment in the Nation.

It is my belief that the factors behind the development of the Route 128 phenomenon have many lessons and applications for public policy, particularly since a major debate on the role of Government in the economy has been underway in the Congress for more than a year. Regrettably, a look-over-the-shoulder approach has taken us down the path of what I refer to as "let's copy Japan, who first copied us" syndrome.

In the meantime, Route 128 has come to epitomize the pioneering, risk-taking spirit that has been traditionally associated with the United States. Both Route 128 and Silicon Valley have served as a reminder of the vitality and force of the private entrepreneurial spirit.

It is my hope that this series of hearings, which began in Washington about 3 weeks ago, will highlight one of our greatest talents, our country's ability to innovate, and one of our greatest resources, the entrepreneur.

I think it is interesting that sometimes in Washington we are looking at Japan for answers, and California is now having the experience, which I am sure you are having the experience here, of Japanese groups coming to the United States to find out what the essence of the entrepreneurial spirit is and to figure out how they can transport it to Japan because they recognize that it is an essential ingredient if we are going to maintain and improve our growth strategy in the future.

This committee intends to examine the governmental role at all levels in fostering an environment of innovation and economic growth.

The field hearing this morning represents, I believe, the first attempt at a comparative analysis of the entrepreneurial environment in the Nation's two premier high-technology centers. These 2 days of committee hearings in Boston were preceded this week, as I said, by 2 days of hearings in Sunnyvale as we received testimony from members of the Silicon Valley community—the first time I think we ever had hearings actually in Silicon Valley. Some people thought going to San Francisco, to Silicon Valley, is anywhere in California. We tried to go right to the middle of it and not only hold hearings, but also to go out to some of the facilities and see their various approaches.

Our first panel of distinguished witnesses will set the tone of discussion for our field hearings by discussing how and why the Route 128 phenomenon occurred near Boston.

I might just say that we have tried to deal with these hearings on a nonpartisan basis. We have, I think, achieved that. We had both Democrat and Republican representation on our committee out in California.

I might say one of the difficulties we have in scheduling hearings is that if you schedule them during the regular legislative period you generally have difficulty getting members to break away. If we hold a hearing in this period of time, sometimes it is easier to get a quorum outside the country than it is inside the country, and I hope you realize that even though I am the only member present at this time this is a committee hearing, and the conclusions and the findings that we come up with will be made available to the entire committee and to the entire Congress, both the House and the Senate.

For our first panel we have present Mr. John Anderegg, president of Dynamics Research Corp., from Wilmington; Mr. George Hatsopoulos, chairman and president of Thermo Electron Corp.—and you will have to help me. I don't know how you pronounce some of your towns up here. Is that Walthan or Waltham?

Mr. HATSOPOULOS. Waltham.

Representative **Lungren**. Waltham, all right.

Mr. George Kariotis, chairman of the board of Alpha Industries in Woburn. Did I get that right?

Mr. **Kariotis**. Yes, sir.

Representative **Lungren**. See, I don't feel bad because when people come out to California they say San Jose or La Jolla instead of La Hoya. So we all understand there are different—also Notre Dame.

There is a friend of mine from Boston. He used to ask for frappes when we went to get milkshakes, and I never could understand that.

And Mr. Roger Wellington, chairman and chief executive officer of Augat, Inc., from Mansfield.

Thank you for coming, and perhaps we can proceed from my right to left with Mr. Anderegg here leading off.

PANEL 1. ROUTE 128 DEVELOPMENT: A HISTORICAL PERSPECTIVE

STATEMENT OF JOHN S. ANDEREGG, JR., PRESIDENT, DYNAMICS RESEARCH CORP., WILMINGTON, MA

Mr. **Anderegg**. First off, I think that you ought to include in your group a broader category than high-technology service organizations. Any kind of startup like retail or any high growth organization that has a high growth possibility should be included.

I want to address first the development of the high-technology growth in the Boston area and also in the peninsular area. It seems to me that it came out of the work that had been done by the Stanford and MIT faculties in the 1930's. They were real hotbeds of strong technical expertise.

When the war started, the natural place to go to get things developed was these particular universities, and there were some stars there, like Frederick Sherman of Stanford, Stark Draven of MIT, and a raft of other guys at MIT. They gave birth to the Radiation Laboratory, which is one of the great hotbeds of development in the control communications.

But there are a bunch of other laboratories there, too. Draven went on to found the Instrumentation Lab, which became a major laboratory at MIT. Al Brown founded the Servo Lab. There was the Lincoln Lab. And at Harvard there were some others that I am not so familiar with.

These laboratories had a lot of R&D funds put into them, and a lot of us had a chance to work in those places, and they gave us the opportunity to make a mistake. They provided us with a lot of funds, and we did the best you could with it. We had good examples all around us. You could talk to people, but they would still let you mess it up.

A lot of us learned, I think, in that environment, and what we learned was to visualize a way of doing things, a way to be able to accomplish something so that if you had the ability, and a couple of other things, you could do it. You are required to have an entrepreneurial organization. You have to be able to recognize the need, and you have to be able to visualize a way to fill that need, and then you must be able to sell it.

All three of those elements were present in many of the laboratories at MIT and then subsequently in the companies. In fact, in our companies right now there are people that we have trained and have come to us that are strong and very able to accomplish things, and there are needs floating by all the time. The company can't do them all, and all of these needs and the recognition of them and the ability to visualize the way to fill those needs come out of those power populations.

One other characteristic of high technology startup, I think, is typically they can be—it is not universal—but in many cases I think they can be started on a shoestring. Frequently—like we started our company on $600, and it ran on $600 for 5, 6, years—more than that actually—1955, 10 years. Then we sprang a public offering. By then we had several hundred people.

Another characteristic is there are typically mixed businesses that get pegged before the big competition will come in and swamp them. Generally, if a larger organization—well, take the DEC/IBM thing. If IBM had recognized the minicomputer niche, they could have struck it away from DEC probably. But they didn't recognize it until DEC had built it into a really large thing, and by then DEC had a lot of momentum.

Another general area I want to take a minute on is some policy principles for Congress.

I think generally the less law, the better. And my reason for that is it goes astray so easily, like low income housing projects, which sounded ideal but in fact they turned out to be just awful slum developers.

And in this department I think one of the best things your committee could do would be to keep your breathren from enacting legislation that is harmful to business in general and startup organizations in particular. Like in our State here we have in the process of going through the legislature a thing called the Grant-Logan law, which to me is one of the most oppressive pieces of legislation that they could have enacted. And if it has just the best intentions in the world even, if they are going to close the plant, people are going to be laid off, and they are going to be without jobs, the idea is to save people from the hardships that come from plant closings. But they have the possibility of wiping out a substantial part of the network of the companies in Massachusetts, and the smaller, the tougher the situation, the harder.

The second point, I think it would be very beneficial to the United States to insist on R&D funds, undirected funds from virtually every Government contract. And I am most familiar with the DOD contracts, where we deal a lot.

One thing you must do with R&D is to allow waste. It is impossible to be efficient. But I think if you look at the R&D moneys that have been spent on Government contracts, DOD contracts in particular, over the whole time from the beginning of World War II through Vietnam, however much money seems to have been wasted there, kind of remind yourself that we got out of those efforts integrated circuits. We got commercial jet aircraft. We got TV, based on all of the work done in laboratories at MIT during the war.

Another thing I would suggest is that you let entrepreneurs have the prospect of being millionaires if they make it.

Society benefits by availability of a device at a profit, and the fact that people are willing to pay for it means they value it for how much they want to pay for it.

The same on options. When Congress made the qualified options, that became a financial power to the recipient, and the best options we ever had in the United States were the old unrestricted options, so-called, back in the 1960's. The sequencing operation virtually makes it impossible to use options as an award to superior performance in an organization.

The last point I wanted to make was keep the regulatory environment simple. A startup company is kind of like a newborn baby. I think every regulation that comes out of Washington is—if you think of the child lying on a mat on the floor—every regulation is kind of like a thread that is thrown over him, and you just throw thousands of threads over by the regulations and they become like a net that pulls him down and saps the energy, the energy that is needed to run it.

Well, those are my policies, I guess.

Representative **Lungren**. Thank you very much.

Now, Mr. Wellington.

Mr. **Wellington**. Congressman Lungren, I would like to suggest that—perhaps I would like to ask my colleague, Mr. Hatsopoulos, to go ahead because—

Representative **Lungren**. OK, fine.

STATEMENT OF GEORGE N. HATSOPOULOS, CHAIRMAN AND PRESIDENT, THERMO ELECTRON CORP., WALTHAM, MA

Mr. **Hatsopoulos**. Again, I am very happy to be here. I think this discussion is very much needed.

As you know, the high-technology industry is the sector of industry that is growing very fast, and it does so by reducing to practice scientific knowledge; applying such knowledge in products and services that are significantly different than those previously available.

There are, of course, other high growth industries that deserve the attention of Congress because they benefit the economy, but here I want to focus on the development of high-technology industry in Massachusetts.

It seems to us that high-technology industry flourishes in a locality which provides a large pool of potential entrepreneurial qualities, technically oriented professionals, skilled technicians, and, more important, the existence of other industries around it that have the same spirit.

In other words, it requires a kind of a critical mass; a collection of industries that then can attract more industries of similar nature. The key characteristic of such an industry, at least here in the Route 128 area, is that it becomes highly goal-oriented, risk-taking, and informal—management is usually less structured than in some of the basic industries. It is an environment that attracts excellence.

I have seen this phenomenon time and time again; we have been able to bring Massachusetts people from other parts of the country, primarily because they were attracted by the style of management as well as the accomplishments of our high-technology industries. Success attracts excellence, and this breeds still more success—a kind of snowballing effect.

Like the previous speaker, all of us here believe that the phenomenon of 128 really got started with the local universities, probably during the Second World War. The key university, the one that played the most important role in this whole process, was MIT. It was a widely recognized leader in technology, although there are other universities of similar nature in the country. What was different at MIT were certain characteristics that I think are very important to the growth process.

First of all, there was an abnormally high volume of device-oriented R&D done during the Second World War, and subsequently during the space program of the sixties and seventies. Device-oriented R&D, as opposed to basic R&D, is very important in the emergence of technical entrepreneurs, which, in turn, are very important to the development of fundamental scientists. The MIT culture was primarily one of device-oriented R&D, coupled, of course, with the Defense Department and with space.

A second important factor at MIT, after the war, was their very liberal policies toward the faculty. I was a member of the faculty then, and I know many others who also started companies in the MIT environment.

As an anecdote, let me point out to you that when I patented a number of inventions, the patents were of course owned by MIT. One day I went to the dean and said: "I want to start my own company. I want to buy back my patents." He said: "Fine, we will give you the patents." And I said: "Let's negotiate the price." And he said: "No, we will give them to you free, because we are likely to get more money from donations when you succeed, then we could possibly get out of you at this point."

Representative LUNGREN. Did that work out?

Mr. HATSOPOULOS. Yes; it worked out.

But for the next 4 years I continued to be on the faculty, doing my work there. I was free to work for my company at night and on weekends. That was official policy—I had even gotten permission to have a direct phone line between the company and my office at MIT, which of course is no longer permitted because of conflict of interest.

Now, a lot of what happened in the 1950's and the 1960's cannot be duplicated precisely today because we have become a much more rigid, formalistic society.

First of all, MIT, because of student movements, is against doing the device-oriented research that is so important. That doesn't matter very much in Massachusetts, because we already have established a critical mass. If we are going to start creating this same kind of thing in other parts of the country, however, that lack becomes important.

There is another contribution that MIT made to the whole high-technology process, and that is management style, a lot of which has been discussed in books and papers about the high technology way of managing. This is an important factor. It makes people feel, all the way down to the technicians, that they are contributing to the creation of something important, and creation is one of the greatest rewards. If they—the employees—identify with the objectives of the organizations, and if management can motivate them to so identify, then even if they could get double the pay somewhere else, they can't leave; the reward of creation is so important. MIT helped produce that.

But I must say that once things got going, the proximity of so many other universities also contributed quite a lot. Overall, there are many conditions that prevail on Route 128 that really make it an effective area to attract the kind of skills and the kind of people we must have.

The culture of the area, for example, has helped attract many of our engineers—we always talk about that in an interview. We have even gotten people to come from California, Congressman Lungren, because they were attracted by some of the environmental attributes. Weather, incidentally, is not one of them.

The city of Boston, its growth, and its growing attractiveness has become very important.

I have thus far talked only about the pluses. Over the last 30 years, there were also some minuses. Many times I was asked, where does the State government fit into this whole process, Well, to be very honest, if I consider the 30 years during which I have been in business, the State government's contribution has, despite good intentions, ranged from neutral to negative. Somehow they were always running behind, and so didn't contribute.

Now, if you ask me what have national policies contributed?—and here is something that our European and Japanese friends can learn; the inherent culture of the people in the United States encourages taking risk and being entrepreneurial. Of course you can't create this overnight in other places, but there are some policies that have helped.

The stock option has been a very important tool, for example. It has been important, too, because you can show somebody that he can become rich—he can hit the jackpot by working very hard. Though the chances of becoming rich are small, the stake is big enough to attract excellence, and people want to participate. If there is a potential for success, however small, then they want to have a corresponding potential for reward. That is a very key part of the whole structure.

Of course, as I said before, the Government policy of putting device-oriented money into universities was a very key element in the process.

Now, I have been in both the university and in industry. I feel that if the Government wants to develop a missile guidance system, for example, it probably could develop it cheaper by doing it in industry, rather than the university. There is a lot of what seems to be waste in the university, but it is not really waste, for a lot of training effort is involved.

Government R&D money also pays for the development of young engineers. The contribution that the Government has made, by putting money into universities, has been very beneficial, at least in this part of the country. However, I see that policy shifting, in order to save money. In fact, many of the things that we are doing wrong, as far as creating more entrepreneurial spirit, are done in the name of efficiency. I'd like to point out that this may be very harmful.

The third element has to do with capital. It is necessary at some point, for a venture to have access to capital. I have been studying this issue, in cooperation with Mr. Wellington and other high-technology people, to see what index might be used to characterize the availability of capital. We have concluded that the best measure is the parameter which we call the cost of capital. By this, we do not mean interest rates. It is a collection of things that have to do with tax law, with the stock market, and other elements that contribute to the availability of capital for entrepreneurs.

There are a couple of items that stand out—capital gains taxes, for example. The rate of capital gains tax is very important, because the reward to the investors in new ventures is inherently oriented toward capital gains, as opposed to dividends.

R&D partnerships are another issue. Finally, there is the whole question of the distinction between equity and debt, an issue which the Treasury has long been struggling with—how freely can you allow convertibility of debentures or how much freedom can you allow to an initial investor, starting in a new company, to provide additional capital in the form of debt. If there is a big risk, and he can provide a large part of the capital in the form of debt, then if the venture fails, he can write off his loss against ordinary income, rather than capital gain.

These are just some examples of the many issues related to the cost of capital, which I think is the most decisive aspect of national economic policy as it interacts with high tech industry.

I would like to thank you for listening to me.

Representative **Lungren**. Mr. Wellington.

STATEMENT OF ROGER WELLINGTON, CHAIRMAN AND CHIEF EXECUTIVE OFFICER, AUGAT, INC., MANSFIELD, MA

Mr. **Wellington**. I have the privilage also, in addition to being chairman of a rapidly growing company, to being the chairman of the Massachusetts High Technology Council, and as a result, I have had the opportunity in that position currently, to rub shoulders and become acquainted with the heads of about 150 companies in this area. And I am always astounded at how this phenomenon took place. And we can certainly learn from history. I don't think history can repeat itself, however.

These developments that came out of the universities were really developments spawned by U.S. Government investment in time of great need. That need was overpowering, overwhelming. During World War II, and the immediate period thereafter, there was very little bureaucracy. It was basically a task-oriented period where the emphasis was to get the job done, not on controlling how it was done nor introducing methods which were counterproductive, in terms of the attempts to put in financial controls that, in fact, restricted the endeavors.

The results were achieved. In fact, the original venture capitalists in this area, without intending to be, were the agencies in the

Federal Government that created this particular movement in time of need.

The universities, as George said, had few restrictions at that time. And they did not jealously protect those results. In fact, they encouraged those businesses to spin off.

And all of this, frankly, I think, happened. There wasn't any targeting involved neither at the Federal level nor at the State government level, relative to the eventual result. I don't think that we can change the environment in Government that is so wrought with suspicion relative to contracting activities. And therefore, it's most important, I think, to think in times of today, in the future, what is it that we perhaps can be thinking about in the light of—I presume the objective is to see if the phenomenon that you're studying can be replicated elsewhere in the country. We here in this area, of course, have a great concern that it remains in its growth mode and does not lose what has brought the area its great benefits.

Our emphasis today, and my feeling on this, particularly, is that all actions that we're thinking about, first and foremost, almost last, first and last, the whole spectrum, must view our companies and our high-technology industries today in the light of a world competitive marketplace. There is no future, if we do not recognize that our future is associated with taking this technology and leading it in its period of fruition, not just discovery, into a leading world market position. That's where we are, and that's where our competition is.

Any action that our Federal Government takes or our State governments take through, perhaps, smugness that actually inhibits this will make it impossible for these industries to be the base for—the most important aspect is employment growth. Too much of our thinking in the past has slipped into the present. I think the leadership of most of the high-technology companies, fortunately, is trying to undo that, but we're witnessing right now in the press, and I fear for weeks ahead, this we and they originating from Detroit, which is failing again to recognize that it's a world market. In the 1930's, when much of this philosophy developed, no one ever thought that we would lose jobs in the United States in the automobile and the steel industry to imported products.

In these industries we know that we can lose jobs—in the high-technology industries—to imported products or our failure to remain competitive.

So we must, at Government and at business levels, all workers have to understand that today, we and they is not a phrase relative to the company and the employee, but it's a phrase relative to our company or our industry and world competition. If we do not defeat that attitude of we and they being the employee and the company, and if labor leadership does not finally understand that this is the theme, we and they being we, our company, we, our industry, we, our employees, and they, the world competitive position, then all of the innovation will go for naught.

For that reason, I think that our company's management is probably more concerned than any industry in the past about the world competitive climate, because our industries have grown up during that period. We never had—if it's a benefit, and I don't think it is—the opportunity to work in a closed competitive society.

The other competitive factor that Mr. Hatsopoulos has mentioned—and it's so critical—and that is, the competitive cost to capital. Once again, it is the we and the they and the labor and the company relationships that must disappear. We must also remove the feeling that taxes on growth industry or any industry is a tax on the rich. It's a tax on employment. It's a tax on growth. It's a tax on opportunity, because it removes the capital that the companies need to grow and become competitive worldwide.

Thank you.

Representative **Lungren**. Thank you very much.

Mr. Kariotis.

STATEMENT OF GEORGE S. KARIOTIS, CHAIRMAN OF THE BOARD, ALPHA INDUSTRIES, INC., WOBURN, MA

Mr. **Kariotis**. One of the problems in being last in one of these is obvious. There's not a hell of a lot original that I can say hasn't already been said.

I'll try to just dwell on the historical perspective of how 128 got to where it is.

Just to kind of establish my credentials in that area, you know, in my real life, I'm a member of the high-technology community. In the last administration, I served as Governor King's secretary of economic affairs. And it was during that period when the word started to seep out of our borders that something phenomonenal was happening in Massachusetts. We weren't feeling a recession like the rest of the country. Our unemployment rate consistently stayed lower than all the other industrial States.

So people started to flock into Boston and ask the question, "How the hell did you do it," as though we had some magic plan. And even though we try to act mysterious about it and act knowing, the fact of the matter is, we didn't do a hell of a lot to made it happen, because it was there. And I've to tell you, since I saw the word "planning" in some of this documentation, there was absolutely no plan that made it happen. I think you ought to realize that.

So when the Government starts talking about planning the economy, I really start getting worried, because 128, as it exists today, undoubtedly would not have happened if some Government plan was behind it. That's not to say, though, that a lot of governmental actions didn't create 128, but they were not interconnected. They're all happenstance, and I'd like just to review that.

By the way, in your travels around the country, there are some other fascinating stories like this. I happened to spend 5 years in Culver City for an Eastern electronics company, by the way, watching that electronics industry grow out there, and watching how those airframe guys, who after World War II had no market for their product, for obvious reasons, and figured they had to do something with those damn big plants. And what they did is, they went into electronics, and where they got their people was from raiding the east coast, and they did a hell of a job.

Howard Hughes, especially, running guys, like, you know, Raymore, Woolridge, and Tex Thornton, and all that kind of stuff.

And up north in your area Turman had this brilliant idea about Stanford Industrial Park, and then the Varions came back from the east coast and the Hewletts and the Packards, and they created this thing.

So there's some fascinating stories around the country about how these cells of activity get created, but let's stick to 128.

If I may just focus on the electronics portion of the high-technology industry, and when most people talk high technology, they're really talking about the electronics portion, although there are many other important facets to the high-technology world that aren't electronic, but nevertheless, this is a very significant one.

That world was created, no question in my mind, by World War II. So, unless you're willing to start World War III, it's hard to repeat that example, but what happened there, of course, was Uncle Sam in his wisdom or somebody's wisdom, sucked up all the talent in the country in electronics and brought them here to Boston. They started a radiation laboratory at MIT, focused on the development of radar, working with our cousins in England, and so forth, on the magnatron tube, and so forth.

And then over at Harvard they created a thing called, I think Radio Research Laboratory, if I remember correctly. And they focused on radio communications. And they did great things that helped win the war. The war ends, and these people have now lived in the Boston area for many years. Their kids have been growing up. They like it here. Their families want to stay, so they stay. Most of them. And they got jobs in the universities, and they also got jobs in some of the fledgling companies. In those days there weren't that many of them. Raytheon is still around. The General Radio is Genrad now. Sanborn Co., Padaqula Pack. There were a few. National Radio, a marvelous company. It disappeared. And these are all companies located in the urban areas. Downtown Cambridge, downtown Boston, and places like that.

There was no 128. Even though I spent my years in the early 1950's in Culver City, 128 was getting built during that time, and I'm convinced that no one envisioned 128 becoming the home of some electronics industry. What they're really trying to do is prevent, from a traffic standpoint, people who wanted to go from the north shore to the cape, from going through Boston. And they built this damn circumferential highway through the pig farms at Woburn where our company is and places like that, to ease the traffic burden. And it did. It worked fine. But what it also did is open up part of the State that people normally would never see. I mean, you know, the Burlingtons and the Woburns, that was foreign country, basically.

And when these companies started to grow in the urban areas, and parking was lousy, and their employees had trouble getting there, and all that kind of stuff, they discovered 128, and they started to move out there. Government once again stepped in to help in that process.

In the middle 1950's, you may or may not recall, there was a great worry about atomic bomb attacks. And so the Government was concerned about dispersing this industry. It turned out at that time, for example, that all the—there's a critical tube in a radar system called a TR tube, a transmit-receive tube, all of it being made in a small geographic area in the city of Boston, and one bomb wipes out the whole industry, and that kind of thing. So, they wooed people with money to move. And they got Sylvania to move out to 128, and that was one of the first electronic companies to go out there, and that was pretty much financed by Uncle Sam, the Federal Government. And out of Sylvania, by the way, a whole raft of companies have splintered off and have become their own—our company is a splinter of a splinter of Sylvania. Roger was an ex-Sylvania employee. And so forth and so on.

And so it's been fascinating to watch this whole thing develop. So, I don't know how you can repeat that performance. That was kind of an accidential thing.

But by far and away, the single most important governmental action, I'm convinced, that has created 128, was the stubborn insistance on pouring money into research and development for a lot of years. And in our particular case, the electronic industry, the pouring in of money into the development of a thing called an integrated circuit. I happen to be old enough to have watched the evolution of that thing, because I grew up at Sprague Electric where you make individual components like resistors and capacitors. And if you may recall—you're too young, probably, to remember—radios, for example, in those days were a whole rat's nest of wires and tubes and condensors and resistors and all that kind of stuff. Equipment was huge, hot, unreliable, heavy and, you know, it wouldn't fit into airplanes and all that kind of stuff.

So there was always this goal of reducing the size and the weight of electronic equipment. And it took decades to get it down there, but Uncle Sam kept pouring money into that effort, particularly through the signal corps laboratories at Fort Monmouth and Wright Patterson Air Force Base, the Air Force laboratories, and at places like Bell Laboratories and Texas Instruments, and those kinds of places, but marvelous work went on. And eventually came the integrated circuit. The transistor developed and the integrated circuit.

Today, all these great things that we rave about would never have existed unless the integrated circuit, the IC, had been developed. That has caused us to be able to build the Digital Equipments and the Data Generals, and I guess the Alpha Industries, and so forth and so on.

So I think that everybody should just pay attention to some of the very positive results that Government-sponsored R&D can create and not dwell so much on the damn failures, because that's the name of the game. It wouldn't be R&D, if you knew what the answer was going to be. OK. And to see the percentage of our gross national product shrinking year by year by year for many decades now on R&D is a sad thing to see, and I think we're hurting ourselves as a nation.

So I'll repeat what my colleagues have said about the need to really foster R&D in industry, in universities, in Government laboratories. I don't care where it happens.

Now I'll sum up my whole story by saying that one of the problems I see in the country and particularly in this State is the failure to understand what the economic system is that built the country, and that's the capitalistic system, the system that understands the relationship between risk and reward.

I think that the 128 belt is a fascinating example of this whole thing in action. What you see as you drive up and down 128 are the survivors. What you don't see are the 5 times as many that tried it and fell and bit the dust.

That's the name of the business and that's why I think we should continue to make it attractive for people to gamble on hitting the jackpot. That's why, when you start talking about things like the capital gains tax, which is a very onerous tax—we have it in this State—it's stupid, and we can't seem to get our guts up to eliminate it. And if you saw what happened to the startups in this Nation when the capital gains tax was, in effect, halved not too many years ago, and what happened to it, when, in effect, it was doubled previously. The relationship to me seems an obvious one.

I think that, both in this State and as a nation, there should be a drive to eliminate the capital gains tax. That's one of my strong feelings.

There are other things that we could go on—I'm running out of time. I want to just make one comment about the stock option business. I am old enough to have seen stock options begin and get muddled up, and they're not quite as effective today as they were when I was younger.

A stupid thing was done during the Kennedy administration, President Kennedy's administration. There was a lot of hue and cry about the abuses created by stock options. So he appointed a panel to look into it, make recommendations. And who did he pick? He picked Henry Ford II to run the panel. Now Henry Ford, we all know him and his background. He wouldn't recognize a $100 bill if it were lying on the floor. And to ask him to try to recommend something that affects slobs like me working on a stock option is ludicrous. And just what you would expect, they ruined the stock option business, as far as I'm concerned.

So if you ever think about, in Congress, or looking again at stock options, my recommendation is get somebody who has been affected by them positively or negatively, at least knows what they're about and let that group work on the situation. Don't repeat what happened under Henry Ford.

That is really all I'm going to say. I will say one other thing to close.

In a sort of a quiet fashion, one of the major ingredients that helped create the 128 belt was the creation simultaneously of a thing called venture capital, which I think kind of got it started around here. And again, the venture capitalists were not doing this out of altruism. It isn't they liked the George Hatsopouloses or the Kariotis—you have to be Greek to be in this business, by the way. [Laughter.]

They wanted to make a buck, and I think they understood the capitalist system very well, and it paid off for them. And of course, that is still a very strong factor in this area, as well as it is in the other parts of the country.

So all those things coming together, not by plan, but by accident, have created this thing called Route 128.

Representative **Lungren**. Well, thank you. Thank you very much for your testimony. It's interesting how, in some cases, it tracks what we hear in Sunnyvale, and in some ways, it's different.

One of the questions that I pursued there, and I'd like to pursue here is this: You have mentioned the tremendous impact of university systems, outstanding universities here, as they did in Sunnyvale, and you've indicated the important part that is played by the Government in R&D, although I will say, it's a little interesting. There's been a stress here on applied R&D. There, they almost talk exclusively about basic R&D done by the universities. As far as the Government was concerned, basically indicated, if you do that, your application of R&D will take care of itself in the commercial side.

But my question is, and I don't pick on a part of the country, but let's take Chicago. Chicago has outstanding universities. Chicago was certainly involved in the war effort. Chicago seemingly would have access to capital, but we didn't see the same phenomenon in the Chicago area or other areas around the country that may have had outstanding universities and may have been impacted by the World War II effort.

What distinguishing things would you indicate that you find here that perhaps, for whatever reason, were not found in Chicago? Obviously, with everything you mentioned, there was the match up with entrepreneurs and venture capitalists that occurred here. There was something that drove people who were in the womb of Sylvania to leave. The same thing happened in Silicon Valley. There they talk about the "Fair Children." Everybody came from Fairchild, all the way through.

What is it? Is there some lesson we can learn from here that we can apply to Chicago, that we could apply elsewhere, that has outstanding universities and that has a certain level or has in the past had a certain level of funding from the Government, in terms of research and development? Mr. Wellington.

Mr. **Wellington**. Not being from the MIT alumni association here, but actually from one of those Midwestern universities, I perhaps can comment. Ann Arbor, MI, has a whole circle of startup companies, and they've had many startup companies, but those companies, by and large, have never gotten beyond their science product development, R&D, initial marketing of their product stage. They've had to abandon the areas for an infrastructure problem that's endemic, I think, both in the area where they are and has a substantial influence also with the inhibitance of this happening also in the highly traditional industrialized areas of the United States.

First, these companies, going back to my world competitive position, they know very well that they will be unable to grow in an atmosphere where a supermaket checkout clerk is being paid $25 an hour, as is the case with the Kroger chain in Michigan at the moment. And they're closing. The whole infrastructure has made it impossible for an industry to develop and realize the fruits of [illegible] product development in those areas.

It's a shame. I don't have a single answer for it, but the direction that we hear in the press this week isn't going to help it. I don't know what Congress can do about it, except that when you're looking at the question of legal measures that affect management and labor relationships and the cost of doing business, if you could put one yardstick up and measure it every time: Will this measure make this Nation more competitive or less competitive? Will it introduce factors that will make it more competitive or less competitive? And let time try to work out that problem. But I have to be not very optimistic about those areas that are in that globally noncompetitive infrastructure. And if we can do ourselves a service in this Nation, we will get rid of, again, I say, that "we" and "they" atmosphere that has created an adversarial relationship which has put some parts of this country out of bounds for participation to the degree that the infrastructure at the university level could make it possible.

Mr. KARIOTIS. I too have struggled for a real answer to that question, because it's a fascinating situation. If you look at the end of World War II in the late 1940's, early 1950's, Chicago was one of the dynamic centers of electronics. OK. Stop and think about it. There were places like Hallicrafters, Zenith, Admiral, Capehart-Farnsworth just down the road in Ft. Wayne—Motorola, and so forth. Really, a tremendous accumulation of some of the strongest electronic companies in the Nation. And it just has been going downhill ever since.

Part of the reason is that some of the raiding that went on by the west coast guys to get their talent took place in Chicago. They did a number on Chicago, as they did in upstate New York and Philadelphia. I mean, they practically wiped out Philco, you know. You don't hear that word anymore.

So that was part of it. Second, and it's amazing how just a few individuals sometimes can affect a whole area and a whole industry. The vice president of research at Motorola is a guy named Noble. He happened to be spending his vacation in Phoenix, AZ—Scottsdale, to be honest about it. Liked it there. Decided that's where they were going to build their next little research laboratory, a beautiful little thing. And from there, they're building this tremendous semiconductor industry. So, even though there's a lot of Motorola still in Chicago, the thrust of their so-called high tech stuff is in Arizona.

So I don't know—I suppose if someone wanted to study the governmental climate in the Chicago area, that might lead to some conclusions. I don't have an answer to it, except to shake my head and say, you know, it happened there and it happened lots of other places. And I don't know, the Government tried to step in to prevent it from happening or help accelerate it. It's just a mystery to me right now. But that's not helping you any.

Representative LUNGREN. Well, as you've all admonished me, obviously, high growth is the generic area. But one of the reasons I'm trying to talk about the high-technology area is because we do have the phenomenon of Silicon Valley and 128, even though we have it in some areas, to a certain extent, these are the two major areas. And there's something—when you generally think—with all due respect to all of you—when you generally speak—you think of engineers and people in the technical field, you don't always think of people dramatically stepping out to start their own business. And yet in these areas, that's been the phenomenon. And you don't look at these people primarily as management types. Most of them don't have Harvard MBA's or MBA's of any type. In fact, I've talked to some in Sunnyvale, that I don't think could find their way through an MBA program, yet they're heading unbelievably successful programs.

It's a remarkable thing, and it's something that we ought to encourage. I know in just a few hours, we probably can't come up with all the answers, but I just think it's something we ought to be looking at, because if, in fact, we're going to be world competitive, there's got to be some way to maintain and foster whatever it was, the atmosphere that allowed those things to happen.

You indicated in your testimony, Mr. Kariotis, about the risk and reward. That's one thing that was mentioned time and again in Sunnyvale. You've got to realize that you have to give people the opportunity to fail. Now they weren't talking about not having a safety net for individuals who fall, but they were talking about the entrepreneurial spirit which indicates that people are going to fail. The only way you can legitimize the reward that does come from successful entrepreneurialship, is that it's set up against the stakes of such great failure. And I don't know if because these areas, certain areas of California—you had an area here where a lot of people came into this area, World War II, working, and so forth. Maybe those were people that were willing to take risks, because they realized the failure in the world that was taking place, and it was easier for them.

Mr. KARIOTIS. Well, there's another factor, I think that—see, we're always so damn easy with our criticism on the governmental process, but we very seldom criticize our whole industrial scene. There's a very basic criticism that exists, I think. And that is, that if you look at the history of this high-technology industry, the shakers and movers, almost without exception, these are people who got out of the bigger companies, the ones that have been there for a long time—and I'll mention them in a minute—and went off on their own. Big companies do not create entrepreneurs. They stifle.

Now when I was a kid and starting in this business, you had accepted names that were the shakers and movers in the electronic industry. I mean, the Sprague Electrics and the Raytheons and the GE's and the Sylvanias and the Westinghouses and the Philcos and all the ones we mentioned in Chicago, by the way. That may be really the key to this whole thing. And everyone of these recognized the oncoming solid state revolution and the need to go into semiconductors and to make diodes and transistors and integrated circuits. I must tell you, without exception, everyone of those big monsters laid an egg. Not one of them made it. Now they're still in the business.

I want to tell you, in this area, for example, one of the earliest pioneering companies in semiconductors was Raytheon. And Raytheon is still in the business, but they had to go out on the west coast and buy a facility out there, but they're not one of the leading companies. They're not the Fairchild, the Intel, the National Semiconductor.

All of these outfits were done by the smart, brash kids that got the hell out and got a few bucks and started to make a buck.

So I don't think—if you're looking for any kind of an assessment of the situation, you've got to come to the conclusion that a large, rigid company, whether it's electronics or whatever it is, does not spawn within itself the entrepreneurial spirit. And to get away from that feeling of oppression, if you want to use use that, you got to get the hell out and start your own outfit. And what allows you to do it is money, and if capital is available, you go do it. Because, even though it's a lot more expensive to start these businesses today than it was when we were young, you can still do it with a modest amount of money.

Representative LUNGREN. Let me ask two forms of questions here.

One is, do you think it's possible for us to replicate what we see here in 128 and what we see in Sunnyvale? That would be sort of specific oriented to these types of communities developing and others across the country.

And second, in addition to what you may have already said, generally speaking, about Government policies, are there any other lessons we ought to learn out of the experience of Silicon Valley and 128 to guide us overall in governmental policy?

Let me just tell you one of the reasons I ask that, specifically. If you look at the total number of jobs created in the United States over the past 12 years, which is an amazing amount of jobs compared to the rest of the world, one thing stands out. One of the major things that stands out is that the Fortune 500 or the Fortune 100, basically has been a wash; hasn't lost any jobs, hasn't gained any. Maybe some of those jobs have changed, but within that category of businesses there's been no net gain. The gain has all taken place in small and medium-sized businesses. And when you're talking about the role of the entrepreneur, these two sites I've mentioned are characterized by the existence of many, many small and medium-sized companies, some failing on a daily basis, some being created on a daily basis.

Because of that characteristic, it seems to fit into what the future may hold for the United States, in terms of where the job creation is going to take place.

So that's why, if your answer is no, we can't replicate Silicon Valley and 128, because they have these unique characteristics, that doesn't end my inquiry, because it seems to me there may be some lessons we learn out of here that can be applied, generally speaking.

Mr. Hatsopoulos.

Mr. HATSOPOULOS. I'll try to reply to this. If you have a vapor, such as steam for example, under compression, and you apply more pressure to create the environment which permits condensation, then condensation will occur. But you don't know just where the process will start. You see, there's no way that even the greatest genius in thermodynamics can tell where that condensation will start. You have created an unstable condition, but you don't know what will actually trigger the transformation from vapor to liquid—maybe it's a little piece of dust that starts it. Maybe it's something else, even a cosmic ray that came into the chamber and started it. I've seen that in the lab, condensation may start in one place, or maybe it starts in three or four places.

How, then, do you target this? You can create the right environment, but then you must let things go wherever they will. By Government policy, we can create the environment in which risk can be rewarded—the jackpot concept. That's why State lotteries work. By any objective analysis, the deal makes no sense to the player—the State government picks up more of the money, it doesn't distribute the profit. Still, this jackpot philosophy attracts thousands of Americans.

Now with high-technology innovation, you do get a jackpot in which there's a net profit. If you truncate that jackpot concept, you kill it. For example, everything that socialism does, tries to truncate the results. Why did this guy become rich? Why should he have stock options? Kill stock options! Another guy got rich because of capital gains, so kill that—trying to equalize everybody. Then you get stagnation.

So it's important to have a proper environment—where there are big rewards if you take big risks. Other things like Government R&D help to oil the machinery—as you pursue your R&D, you also educate engineers. The reason that those guys were so good, that came out of the instrumentation lab of Charles Stark Draper, is that they were trained to make a device that does a specific job. So when I get one of those engineers and I give him another job to do that is completely different, he has the training, so he will perform. That is probably the main contribution of Government R&D—developing people.

What I'm trying to say is that you can target an area of the country, and you can create the right environment—today there is Silicon Valley and Route 128. You'll see many more of those in time if you create a better environment throughout the country to foster the necessary kind of creativity. Maybe It'll be in the South the next time, or maybe Ann Arbor, or who knows where else?

Mr. **ANDEREGG**. I think one of the major contributors to the real development takeoff was after World War II, the GI bill. Many of us got through school on the GI bill. I remember just living on $75 a month for room and board during school.

Mr. **KARIOTIS**. $65.

Mr. **ANDEREGG**. Yes, $65 to start, $75 to end. [Laughter.] I remember the good part.

Representative **LUNGREN**. He was in a class before you. [Laughter.]

Mr. **ANDEREGG**. But that thing really fostered all kinds of guys. Now what have you got in similar generations? I mean, an awful lot of people went through school and engineering school was one of the very popular ones to go through in that time. So there was a case where the Government fostered an environment where you got all these guys that are equipped with the ability to do stuff and there are opportunities all around, and some of them recognize the opportunities and off they go.

Representative **LUNGREN**. Let me ask this, and I know obviously every company has its own style, but are there some senior management characteristic or attitudes that would identify a Route 128 company, as opposed to the traditional companies that some of you mentioned before?

You said the management style is different. In what way is it different, and why is that important with respect to growth industry?

Mr. **ANDEREGG**. Well, I got one of those. I can't speak for all companies in the area, but I know in our place, we have a lot of respect for individuals, and it doesn't matter whether the guy's a janitor or a senior engineer, as a person in that organization, he contributes, and he's not a number or a thing. I know we're smaller than General Motors, and it's hard if you've got 600,000 employees to know them all by name, but there's an attitudinal difference, I think, that you see between really large, heavy manufacturing organzations and some of the lighter, heavily engineering oriened organizations you see here in this area. And boy—that attitude—respect is a big thing. You recognize opportunity when it shows up, and you don't really care or at least you try not to care, you try to recognize it no matter where it happens in the organization—achievement, rather, not opportunity. Try to recognize achievement or performance at all levels.

We try—we value our senior people, but we don't let seniority be the only reason we advance people. We try to advance them on performance and recognize performance at all levels. It's not easy, and we're not good at it, but we sure try.

Mr. **WELLINGTON**. I would be very surprised, if we could go into very many companies in our industry in this area and find workers on any kind of piecework or speed-related type of pay, because that is a demeaning type of management, in my opinion. And I think a lot of my colleagues feel the same way. A human being should be doing things which utilize his most valuable asset—it's the most wonderful computer, his brain, her brain. To try to motivate somebody by a Charlie Chaplin-type scene is just a time of the past. Automation surely cuts the cost of producing a part, but I think it has a much more important result. It removes the need for people to do boring, repetitive work and frees them to be trained and developed for more interesting work that really gives them the opportunity to be creative, even though they may not have had the benefit of one of these educational backgrounds that we've addressed at this point.

So I think it's a respect for the people as human beings, rather than as a tool to put things together, that has been characteristic of the newer companies as opposed to some of the old, traditional companies. And for that reason, we also tend to have smaller plants. People can be closer to the management. In our company, we have 4,000 employees, but we have 32 plants. There is no benefit to have large plants. There's a lot of distraction from having them, because the people cannot have direct relationship with the management of the company when they're in a great mass. There is no economic benefit in most of our companies to sit in a large room, looking over lots of smokestacks.

There's a lot of benefit, however, to get out of that room and get down in the plant and treat the people not as cheap mechanical labor, but as the true asset that they have, and that is, the world's best computer.

Representative **LUNGREN**. You've all mentioned stock options, and you've mentioned capital gains tax. Interestingly enough, they were both mentioned in Silicon Valley. Stock options, particularly, were mentioned from the standpoint of a reward to the employees and one which they find very difficult now to apply, both because of the confusion involved—these are, as you are, remarkebly intelligent individuals who deal with very difficult situations, technically and by building companies, and they have very little success even understanding what our rules are. You can imagine how difficult it is for those of us in Congress to figure those out. But they seem to indicate that stock options and an opportunity to participate in the ownership of the company were important, in terms of their work force.

Do you folks feel that way, as well?

Mr. HATSOPOULOS. Well, I think many of us do feel that way. As Roger mentioned before in his company of 4,000 people, there are 359 people that have stock options. The ratio in our company is similar to that—we have about 3,000 employees and about 220 or so participate in stock options. That sort of ratio is completely unheard of in large companies, in basic industries. And can you imagine having that ratio in, say, General Motors?

Now, from a purely financial standpoint, the same aggregate amount that the employees now earn could have been distributed by means of higher salary—the company could afford that. But distributing all these gains through salary, and not tying it to the success of the company, is completely ineffective.

Therefore, I think options are an important tool, not just to motivate or direct or attract very high level management, but also for creating a team spirit throughout the company. This, incidentally, does relate to the issue of management style that we have discussed. I find that to be very consistent with the concept of respect for the employees as a human being, ultimately translates into many pluses—good communications for example.

In our company, a person several layers down in the organization, can express a criticism of company policy or of some particular management practice. They can talk to me about it at a party or come to my office and speak out with impunity. That cannot happen in Ford or General Motors. There, they have a stratification of management; there is little or no communication. We use a very different style of management, assuming that every employee is thinking for the benefit of the company, and has a brain—he is not a slave. I think that is very important.

Representative LUNGREN. Let me ask you this. It is a little different subject.

But one of the things that struck me was your stress here on R&D being very important, but applied R&D, by the Government. In Sunnyvale they referred to basic R&D. I don't know if that is really reflective of a difference in attitude on the part of two different areas, but at the present time, with respect to the Federal budget, with respect to R&D, would your emphasis be on basic R&D or applied R&D?

Mr. KARIOTIS. I think it would be both. I think the universities are the natural place to do basic R&D, and the applied R&D seems to have a better home in industry. But I don't see how you can neglect either side myself.

Certainly, you are going to start with the basic R&D.

Mr. **Hatsopoulos**. I think that there is an appropriate ratio on that. I was on the MIT faculty in the late 1950's and early 1960's, and we felt then that there was an imbalance in Government-sponsored R&D; too much applied research and not enough basic work.

I was in the National Science Foundation meeting where that was the subject. I was asked to give a keynote address about system development as opposed to basic R&D.

There is no question, today, that we have gone quite far in the other direction. I am not talking about a particular locality or any specific technology—maybe the semiconductor industry needs still more basic R&D—but as a whole I think the Government has swung too far toward basic research. The balance is not quite right.

Right now I feel that both basic and applied R&D should be pushed in total, and even if the ratio stays what it is now, there could be a little more of a systems orientation to the work.

Representative **Lungren**. Let me ask you this: what is the appropriate Federal role in the area of commercial R&D? Is it to encourage it through a tax incentive? Is it to encourage it as a direct result of simplifying the Tax Code and therefore allowing more profit to be maintained and letting the companies decide without the encouragment of a specific tax incentive or, as someone suggested, grants or subsidies to certain firms to encourage R&D?

Yes; Mr. Wellington.

Mr. **Wellington**. I don't believe that the granting of sums to firms for the development of a product is an effective use of the Government's or the taxpayers' money. I do think, however, that there is one aspect of this goal that we are looking for here in this discussion that we shouldn't forget. That is as the technology has become more complex in many branches of our industries, and just like biotechnology, too, the capital cost to start a company is much higher than it used to be when some of our companies were started, because of the exponential rate that the technology is growing. So the newest spawned companies are much more expensive to start.

What is happening to the venture capital industry is that it is more and more prone to put money in at the B stage, what they call the successful beta site stage, instead of the idea stage because there is a high risk of failure. In addition, they tend to move more with the larger sums to the stage where it can then be liquidated more quickly in the form of a public offering.

There was a proposal in Congress a year or so ago, which I testified against, that would have given a 10-percent preference on startup ventures in the tax treatment over the normal capital gain. That is inadequate. You can put money aside in a Government bond and wait 5 or 6 years and do better than the 10-percent differential.

But there has to be a greater financial motivation in the tax structure for the true venture startup because the capital requirements of the new startups are higher than they used to be, but the large capital venture sums tend to flow in the direction of greater assuredness of a reward. And I think that the tax structure should be looking at absolutely a zero capital gain tax for that money that is put in there on a true startup.

Representative **Lungren**. Yes; Mr. Kariotis.

Mr. KARIOTIS. I have a number of things to say.

No. 1, perhaps an innovative way to approach this capital gains thing is to make it—to induce folks who have achieved a capital gain to reinvest that money into the economy. That is really what we are after as a nation. We want that money back in working, creating jobs and companies and so forth.

We don't necessarily want to reward somebody in an extraordinary fashion if he wants to take that little pot and go to Monte Carlo and live on the Riviera.

Representative LUNGREN. Are you talking about perhaps a rollover provision, as long as they maintain it under another investment?

Mr. KARIOTIS. Yes; absolutely.

We have talked about doing that in Massachusetts to have people, if they reinvest in Massachusetts-based companies—and it gets hairy, but, you know, that doesn't mean that something along those lines can't be done.

So that is my comment on the capital gains tax. I have to disagree violently with my friend Roger on his opening statement. I think absolutely it makes sense for Uncle Sam to give development money to companies to develop products. The integrated circuit that we know today would never have existed unless that happened, and that investment went on for 20 years. You ought to sometimes, if you have the time and can find somebody who lived through it; trace the history of the integrated circuit and see the many byroads, and so forth, that were taken and the money that went down the rathole but has ended up with a great product—the 707, for example. I can use another example.

So I don't know that Roger really meant that in quite the sense, but I sure as hell believe——

Mr. WELLINGTON. Absolutely; I did not mean that.

Mr. KARIOTIS. Oh, OK.

Mr. WELLINGTON. What I meant——

Mr. KARIOTIS. That is the way it came across, Roger, and, you know——

Mr. WELLINGTON. Well, let's get the record correct.

Mr. KARIOTIS. OK.

Mr. WELLINGTON. What I meant was to throw some money out there without a need identified.

Mr. KARIOTIS. Oh, I agree with that.

Mr. WELLINGTON. You see, going back to the origin of this phenomenon in this area, there were some needs, right, and there was some money invested to fill those needs, and they were given pretty blank checks to do it.

Mr. KARIOTIS. Yes.

Mr. WELLINGTON. And there were very few abuses of that. There was waste of it sometimes but very few abuses.

Mr. KARIOTIS. By the way, one of the things that should be said at this point is that one of the agencies that takes the damnedest beating in the press and in the Congress is the Defense Department, and the Defense Department has sponsored most of these developments that we brag about today which created this industry.

Representative LUNGREN. You keep mentioning the 707. I happen to represent Douglas Aircraft.

Mr. KARIOTIS. Oh.

Representative LUNGREN. And we recognize how successful Boeing was with the 707, which is just a commercial offshoot of the Government-sponsored plane. We have done a reversal. We are now putting a KC-10, which is the——

Mr. KARIOTIS. Not the DC-10?

Representative LUNGREN [continuing]. Government application of a commercial venture. We did it in reverse, and we are finally selling some aircraft after a long period of time.

Mr. ANDEREGG. Could I add one thing?

Representative LUNGREN. Certainly.

I just wanted to ask you, I assume that shoestring you talked about that you started your company on has got to be longer today than it was in that day?

Mr. ANDEREGG. It is quite a bit more solid now.

But on the Government R&D and funding R&D, I think the Government ought never to set out to fund R&D in general, so to speak. Let me amplify a bit.

I think they always ought to be trying to get something. Like from Boeing they really want a KC-135 because they want to get some fuel transferred in air, whatever was the game with that thing when they set out with it. Boeing subsequently, I think, made it into a 707. But the Air Force, what they wanted was a tanker and a fast one.

The Government always has to have something specific that they think is useful, that they want, and they should never throw out money in hopes that people are just going to come along and do something great.

And I am not talking now about these contracts. I think military contracts, for instance, or the contractors always ought to be forced—not the contractors, but the Government contracting officers always ought to be forced to include R&D funds in military contracts. And the people that get the funds they can spend them in ways that are generally beneficial to the agency that is contracting with you, but no general altruistic lavishing of money on us or anybody else in the United States. It just seems to go down a rathole and creates all kinds of problems.

Representative LUNGREN. Well, as I say, unfortunately the time is up. I enjoyed this discussion very much.

Obviously, we just touched on a number of different things, but one of my hopes is that we can try and focus some attention in Washington, through the Joint Economic Committee, on some of these questions because they are not always the questions that are asked in Washington. I certainly don't want to see the demise of the smokestack industries prematurely, but I think we have to recognize that we have at least got to get high-technology envolvement in our smokestack industries if they are going to survive to any extent whatsoever and that we have to look to the future as to where the great jobs are going to be—the greatest number of jobs are going to be created in this country, and we have got to be concerned about creating an environment for that.

The Government does a very good job of looking back, but unfortunately we usually take the lessons that were applicable then and try to apply them to the future, and that just doesn't work very well. I would just like to draw some lessons out of the experience you have had in what is happening presently and see if they might also guide us to future governmental policy. Not that we are going to duplicate Route 128 across the country or Silicon Valley, but there ought to be some lessons we learn out of what was made here that we can apply in our policy, public policy decisions in Washington.

So again thank you very much for your time. I certainly appreciate it. [Pause.]

The second panel will deal with the question of management-employee relations: loyalty, motivation, and reward, and at this time I would ask Mr. George Berman, Mr. Peter Sarmanian, and Mr. Oliver Ward to come forward for our second panel.

OPENING STATEMENT OF REPRESENTATIVE LUNGREN, PRESIDING (PANEL 2)

Representative LUNGREN. Thank all of you for coming as well. I certainly appreciate it.

One of the major focuses of our committee hearings is on what I like to refer to as the people factor, those policies that reward risk taking, innovation, and entrepreneurship.

Two years ago, a congressional committee reported that the human factor in productivity improvement is underestimated and is the least understood facet of innovation. However, I have found that such committee findings, humble as they are, are rare in the Congress.

All too often, the people factor as it relates to economic growth is ignored in the committee and meeting rooms in Washington. The economic policy discussion instead is often focused on theories on how the economy performs rather than on what motivates those individuals within the economy and how to encourage their ingenuity and their imagination in the spirit of entrepreneurship.

There is little doubt that our country has the resources and the ability to maintain our technological leadership, but to preserve our competitive edge we will have to focus on policies which bring out the best in the individual and entrepreneur.

Many companies are known for their efforts in making their computer products user friendly, but similarly to neglect the people factor in policymaking would be, I believe, a tragic oversight.

If there is any area of entrepreneurship in the process of innovation where the people factor is most evident, it is in management-employee relations.

Today I would like to find out why many Route 128 companies have developed the reputation as some of the best companies to work for in the world. Obviously, a large part of the answer is rooted in the willingness of companies to experiment with creative management techniques and to establish work environments which encourage creativity and innovation.

But the committee would like to delve further to discover what has worked and what hasn't worked. Specifically, if the people factors influencing innovation would be categorized into rewards and barriers, what major rewards and what major barriers would be identified, and to what degree has the traditional management-employee hierarchical structure or even, in some cases, antagonistic relationship been intentionally disregarded? How are companies which have increased in size over the years able to maintain an entrepreneurial spirit, and how do employees share in the gains made by a company? What should the proper role be for Government at all levels to help foster an environment for entrepreneurship and innovation?

The committee is interested in seeking answers to these and related issues in today's hearing, and I am pleased that we have on this panel representation from three major companies which have become recognized for their deliberate emphasis on positive and effective management-employee relations.

We would ask you to limit your comments to no more than 10 or 15 minutes, so then we can go into questions and discuss this issue. I know you want to talk about some of the things that we mentioned in the first panel as well.

So, first, I would ask Mr. George Berman, chairman of Unitrode Corp. of Lexington, to proceed.

PANEL 2. MANAGEMENT-EMPLOYEE RELATIONS: LOYALTY, MOTIVATION, AND REWARD

STATEMENT OF GEORGE M. BERMAN, CHAIRMAN, UNITRODE CORP., LEXINGTON, MA

Mr. **Berman**. Thank you.

Well, I think we ought to identify ourselves. I do have an engineering degree from MIT and an MBA from Harvard, if that does you any good, and I have been a chairman of the New England Council of the American Electronic Association. I am presently a director of the national.

Now, I run a semiconductor company, or at least the company is known as a semiconductor company, and most of our products are in that area.

We started 25 years ago, and the shoestrings were much smaller then. Our company will do more than $200 million this year, and we started 25 years ago on less than $600,000.

In common with some of the others, our 3,000 employees are in 10 different plants, and they are in California and various parts of New England as well as in Mexico and Ireland and the Far East.

So I just want to add an item or two as to why California, why New England, and there are probably a lot of reasons. But I don't think we discussed—I don't know if they are cultural or sociological reasons.

One of my pet theories has always been that the people who got out of the East or the Middle West and went to California and the Northwest were much more enterprising and had a little more get up and go and had the guts to leave wherever they were stuck and go somewhere where there was some opportunity, and, therefore, there was rather perhaps a different kind of person to be found on the west coast, you know, from the Northwest down to San Diego certainly, than you find in many other parts of the country.

Representative **Lungren**. I must say that is the kindest description of Californians I have ever heard. I certainly appreciate it.

Mr. **Berman**. Well, as I say, some of our best friends are Californians.

And why around here? The Boston area is pretty small, and what it doesn't have in common as much as, say, New York, Baltimore, Philadelphia, is it doesn't have as much hardening of the arteries and stiffness, and so on, as some of those other cities.

And go back to the cultural, sociological aspects. I think you will find an enormous number of these companies were started by either immigrants or close to immigrants, people like many of us whose parents were born in Ireland or Poland or Greece or somewhere else, and not suffering from what goes on in—or what seems to go on in the middle of the country—a certain stiffness, a certain playing according to the rules that you find. They tend to, as soon as anything works, codify it, put it into a straight jacket, make rules about it rather than let it remain fluid and create the atmosphere where—or an environment where—more innovation can be.

So I think that is one of the reasons why not Michigan. I can't imagine it happening in certain parts of the Midwest.

Well, I think as far as management-employee relations, loyalty, motivation, and reward, again I think you find that you have talked to probably the only 3 or 4 in the 100 or so in the mass area technology council or the 250 or so in the New England AEA who have any gray hair. It is basically a much younger group than the group that runs mature industries.

I think they come from a different place. They really care much more about the balance between quality of life than the financial results. I don't think there is any question about that.

I think you heard that in what the prior panelists have said, and you have probably heard that in California. They actually care an awful lot more about the employee than in many of the other businesses.

Many of them—or most of them even—are sons and daughters of working people. You find it in style of management, which is one of the questions you asked the previous panel. You find fewer layers of management between upper management here and the workers or the creators—the creators, innovators, the ones who make it, really make it happen.

We are mostly unfettered by the walls and boundaries and artificial problems that come from having unions, and whereas unions in many instances are valuable and certainly were necessary even in New England many years ago, it does create barriers and walls, difficulties as far as both establishing the proper relations with your fellow employees as well as creating a lot of very difficult situations.

So I think I have probably said all I have to say on those subjects for the time being.

Representative **Lungren**. Thank you very much.

Now we will hear from Mr. Peter Sarmanian, the president of Printed Circuit Corp. in Woburn.

STATEMENT OF PETER SARMANIAN, PRESIDENT, PRINTED CIRCUIT CORP., WOBURN, MA

Mr. **Sarmanian**. I thought I would address this morning the topics of the loyalty, motivation, and rewards and specifically about the industry I am in.

My company manufactures printed circuit boards, a relatively new industry, and we are a service organization for all of the electronic firms from one end of the Nation to the other. We have approximately 1,600 competitors, and my company is in the top 5 percent of that.

It is a very segmented industry, also competitive. We are also competing for the people we want to employ. The industry is self-taught and there are no formal education courses for the various disciplines needed within our plants.

Our processing include graphic dots, electroplating, chemical, and electromechanical skills for the manufacture of a single printed circuit board. The state of the art now is extremely technical, very capital intensive, and rapidly changing.

Relating to what my company has done for our employees, we have started with our company culture. We have made the employee a key part of our corporate goal and a part of our corporate growth, and it is our responsibility to provide them with an opportunity to grow and make them feel a part of the winning team.

To do so we have established four basic objectives as our corporate philosophy in human relations. They are the mutual respect for each other, motivation by positive deeds, a strong corporate and company communication at all levels, and the striving to work to create a team organization.

Our corporate culture which addresses these objectives is an attitude based on a policy of openness, a concern for the employee's welfare, and the ability of management to be flexible enough to address those needs, and also to be able to address the changing demands of the industries we serve.

Our human resource organization recognizes that personal planning, both long term and short, is a part of my day-to-day's decisionmaking process. This is not a time-consuming job but an attitude among all the employees within the company.

A strong and permanent personnel department is as important as any manufacturing group or department. Without them the problems of recruitment, training, communication, and motivation would be difficult.

One of the important jobs of that department is to be able to have proper hiring techniques to acquiring employees for the potential for growth. Training programs, both formal and informal, are totally supported and recognize the only way we can motivate and encourage our employees for growth within the company.

Audiovisual aids, classroom programs, job descriptions for all processes are the full-time responsibility of the training manager and the department supervisors. Open discussions about problem areas. Quality, process control are reviewed so that all the employees are constantly being trained to improve and contribute to a better product to serve our customers.

It was earlier asked what makes this area a little different, and I tend to believe that people here want to be involved. To do so we have created in my company monthly employee meetings. But they speak about our problems, and we speak about theirs. We have our customers come in and speak to our employees because I think the positive attitude, that quality and service is everybody's job, is a realism that must be reinforced to those employees.

Productivity and quality are spoken about daily in each department. On the subject of education, I heard earlier that the universities were so important for an ongoing growth of the electronic industry and the high-technology mentality.

In my business there are no schools for it. So 2 years ago five of my competitors and myself decided we should start our own mini-courses at one of the local colleges. It became a 14-week technical course given by our managers and the college staff jointly. The success of that course has become phenomenal. We have made this twice a year and are taking the same curricula and bringing it back into our plants by giving courses in managerial training also.

I believe that the trade associations have done a good job for our industry, and the opportunity for employees to be motivated by attending these to better understand the rapid changing technologies.

All of the normal items most companies have—bulletin boards, employee suggestions, company newspaper—are things we decided must be used constantly and reinforced by our management.

I personally write a report in my company newspaper every 2 months. The report tells them what is happening in our local area, our industry, our competitive problems, and what we can do as a company to adjust them.

We also allow our employees to become involved in local politics and committee affairs, using company time to do so.

One of our pet company projects has been to support the senior citizens groups and youth programs in our surrounding towns.

All of these are elements of what we do to motivate our employees because we feel that communication, team building is an important factor in making a good company.

It is also our job to teach the employees that profit, quality, and customer service is a key for them, for us staying in business. To do that, when they meet the goals that are given, the rewards must be given to them.

My profitsharing plan has been in place since 1967, and we have participated in that plan each and every year since that date. Our bonus system is given on productivity and quality objectives, and they are shared by my management and supervisory levels.

At best, all the problems of running a rapidly changing business have many situations that make it hard to address the problems of motivation and reward systems. External factors, such as market changes, product obsolescence, and foreign competition, make our job of reinforcing that difficult, if not impossible.

The culture we have created in our company is still the philosophy that people will do a good job if you communicate and motivate and make them part of a winning team.

Representative LUNGREN. Thank you very much.

Now we will hear from Mr. Oliver Ward, president of Germanium Power Devices in Andover.

STATEMENT OF OLIVER O. WARD, PRESIDENT, GERMANIUM POWER DEVICES, ANDOVER, MA

Mr. WARD. By way of background, I started out at Harvard undergraduate, went to law school at the University of Virginia and practiced law for 12 years and then decided to go where the grass was greener, into business.

We started our company 11 years ago by buying the germanium power transistor line from Solitron Devices in Riviera Beach and moving it to Andover, MA. Believing that Boston is still the hub of the universe, we did not even think of leaving the business in Florida.

We located space in an old American Woolen Co. mill building, signed a 5-year lease on 28,000 square feet, and were off and running. We have since purchased the germanium small signal divisions of General Electric, Texas Instruments, Philips in the United Kingdom, and the germanium rectifier division of Westcode in the United Kingdom.

We have developed on our own a line of germanium photo diodes and have just concluded negotiations to acquire two other lines from a large semiconductor manufacturer, which should take our sales next year to over $10 million.

This all, of course, is peanuts compared to Digital, Data General, or Prime, but it is big stuff to us, and it sure beats practicing law.

All this we did without any venture——

Representative LUNGREN. What about renegades? [Laughter.]

Mr. WARD. All this we did without any traditional venture capital, and we have only had debt for a short period to time involving the acquisitions from Texas Instruments.

We are privately owned. We now have 125 employees and will, with the new lines, go to about 150. We have always been profitable. Essentially, we are a high-technology company specializing in lines which have decreased to such a size that they are no longer of interest to large manufacturers, but for which there is still a viable market.

In the case of photodiodes, we are entering a growth market which will be a new and different and terrifying experience.

Of enormous importance to us is the quality of our people. We have a very low turnover of personnel and, in fact, have only lost two middle-level people, both to Unitrode whose distinguished president is on this panel, and for which I will never forgive him. [Laughter.]

How do we keep our people? We distinguish ourselves, I think, really only in two ways. We have, in addition to the usual benefits of health plans, cash bonuses, and the other usual sorts of things, a generous profitsharing plan. Whereas our original and only equity capital was $325,000, we have established a noncontributory profit-sharing plan which now has in it over $2 million.

This, truthfully, is a benefit understood and valued by employees generally over 40. In all fairness to a 25-year-old, the prospects of an enhanced retirement 40 years hence truly tests the outer limits of postponed gratification.

The second distinction is to a large extent a function of size. We are part of an extended family. It is a lot easier to know and have concern for 125 people than it is for several thousand.

Stock options to us have proved of relatively limited value because being privately owned there is a long period of time before they can be—real value can be realized; namely, presumably on the sale of the company.

How do we motivate people? Well, in truth, we probably don't. I firmly believe that parents, and not employers, motivate people and that by the time we get them the work or the damage has long been done. We try to pick people who are motivated and do our best not to demotivate them. There is very little stroking at GPD.

We have a very simple credo. We try to be fair and we try to be consistent. We do our best to let people know what is expected of them if it is not evident that they know it already. We try to be flexible to an individual's needs. I am sure we don't always succeed, but we try. If an employee wants to work his or her own hours, we try to comply. We are open from 7 a.m. in the morning until midnight, and I wasn't surprised to find several years ago that a thief was caught in the plant at 4 o'clock in the morning by a maintenance worker, a machinery maintenance worker, who was there at his convenience, not at ours. Why anyone would want to work at 4 o'clock in the morning I don't know, how do we as an industry distinguish ourselves from the more traditional large smokestack industries? It has been frequently said that the knowledge-intensive industries maintain a more enlightened attitude toward the work force whatever that means.

I think in the simplest possible terms the fact that it is a comparatively new industry, it is largely nonunion and nonbureaucratic. We still have the right, though very carefully exercised, to fire, which sharply distinguishes us from the unionized companies such as General Motors and other large bureaucratic companies.

People know that they come to work and the quality of their work and the level of effort will be the basic guarantee of their continued employment. Whereas much has been said and read of the outrageous golden parachute deals, again in the more traditional large non-high-technology companies, job security and job agreements are the exception rather than the rule. Total job security is essentially inimical to productivity and creativity.

What can you do to help? I assume that, being from the Government, you are here to help. My suggestion is that you leave us alone as much as possible.

I would only suggest that a cursory examination of the post office and defense procurement practices will lead an impartial observer to note that the private sector is more efficient with less rather than more restrictions. We do not need an industrial policy.

The restrictions on Japanese imports have cost the consumer billions. If Detroit can't respond to the marketplace, let them hurt until they do respond.

May I remind you that from the ashes of the textile industry, in the form of plant space and direct work force, sprang many of the high-technology companies around the Boston area.

The danger with an industrial policy is that it will be politically motivated to support uneconomic enterprises that should die.

What will benefit us is the continued policies which encourage savings. The benefits of the last two reductions in the last two administrations with the capital gains tax have caused an unprecedented flow of venture capital into the economy, and these two factors will bring benefits to the country in the form of jobs and increased productivity for years to come.

In 1977, $20 million went into venture capital partnerships. The capital gains tax in 1977 was approximately 49 percent. In 1982, the figure was $2.4 billion, and in 1983 it was $4 billion. That capital, in addition to the flow of well-educated people into the economy from the universities, together with benign Government policies, offers enormous hope.

I think I would add only one basic thing to that, and that is what, from my perspective, basically distinguishes the Palo Alto area and the Boston area. First of all, venture capital started in Boston with American Research & Development and in California with Hambrecht & Quist. California was very early on into venture capital. That, coupled with the unique university environment in those two States, the flow of engineers out of places like Stanford and Cal Tech and in the Boston area from MIT and Northeastern, Worcester Polytech, and so forth—those two have been magic. I mean, you add those two together, and you get a dynamite high-technology economy.

I think to a certain extent it is very difficult to replicate that elsewhere in the country because with the possible exception of Texas, you don't have any other area of the country that produces that number of well-educated technical people, and without that, plus money, you haven't got a chance. And it is very difficult, I think, to impose that by the Government.

Representative LUNGREN. Thank you.

Let me just ask this about this particular area. In Silicon Valley they have the phenomenon of perhaps having too many jobs chasing too few people. There is tremendous mobility among the high-technology firms there, rapid turnover, at least compared to other industries that we have been able to see.

Do you have a similar type of thing here?

Mr. WARD. Yes; and it is probably going to get worse. The shortage of engineers in the New England economy is enormous, and what is difficult—we did a lot of work on that. I served on a commission with the New England Board of Higher Education. I am also on the executive committee of the New England Association of Schools and Colleges.

And what we found was that it comes close to being an incurable problem because, whereas originally the area we were focusing on was to try to get more universities to produce more technically qualified people, in fact the problem—it turned out to be that the high schools aren't producing enough kids that are qualified in math or science, and because you have such enormous problems at the high school level with introducing differential pay, you can't attract qualified high school teachers in math and science. Whereas the universities routinely have differential pay for teachers and professors in math and science, the high school level, because you have a very strong teacher union biased against that, won't get into it. As a result, the pay that the high school teachers receive is so low in math and science that they just can't get and hold enough teachers that are qualified, and therefore, the system isn't producing enough kids who then can go on and do the work at the undergraduate and the graduate level.

So that is a real problem, and it is going to get a lot worse. As the economy demands more and more people with a technical background, it is going to get worse rather than better.

Representative LUNGREN. Mr. Sarmanian.

STATEMENT OF PETER SARMANIAN, PRESIDENT, PRINTED CIRCUIT CORP., WOBURN, MA

Mr. Sarmanian. I presently employ 440 people, and I am a totally private company, also. The thing that we have seen in the last 8 months is the inability of us to acquire good help because, first, as you already know, unemployment is very low in this State. Last month it was 4.2 percent.

Mr. Berman. That is actually overemployment.

Mr. Sarmanian. That is overemployment.

Then for us to acquire people becomes a very difficult problem.

Representative Lungren. That is a nicer problem to have than what Michigan and some others have.

Mr. Sarmanian. Yes, it is, but it also brings a whole new—it is tough on our growth. We end up being a company who hires a great many immigrants, that are non-American speaking—non-English speaking—which is fine. They are hard workers, and I have to relate to what George said earlier: We are creating a generation of letting them come into the doors to do the job, and we have to adjust to that.

My company is semiautomatic in many areas of its production, but it still requires a lot of manual work, and the only way we can incite people to come in for those manual jobs is to make them feel that they belong here. We try to speak their language, try to make sure that they feel comfortable working.

From the last count I heard, we had 30 nationalities in our doors, and we are only a small company. But we feel that the area of being people-oriented is extremely important because turnover rates can be costly, not only in our training programs but in our productivity and the loss of quality.

In these areas I think it behooves the Government to understand we must do something to motivate people to work in the areas that we can't find jobs. I get confused when I find that there are jobs wanting and people don't want to work.

So we address the area of looking for the people who need work. I think that becomes an important factor.

I think it also behooves the mentality that in this area we are very family oriented. The family is a strong motivation for people to work and keep them together. That is why the immigrants in this area are always looking for work.

Another factor is that they go through a cycle, and I think it is almost 10 or 15 years, and then their children become assimilated into the same—go through the same problem, and I think that what we have to do is think about what we can do to get more people to come into this country so we continually have that growth factor, that motivation of the job and country and product. I think that is an important part of it.

Representative Lungren. That brings up a point that is not precisely on the subject matter of this panel, but I would like to throw it out.

Congressman Frank and I cosponsored an amendment to the immigration bill because the original version of the immigration bill said that if you came from another country and went to one of our institutions of higher learning you had to return to that home country for a 2-year period of time before you could make an application for purposes of work in this country and then go through the regular certification process.

That was done in the original bill because we had found that one of the easiest ways to circumvent the law—and if you have a law, you either ought to try and make it work or get rid of it—but one of the easiest ways to circumvent the law that was discovered was those people came here on student visas. Typically, they got their degree after 4 years, and then made applications immediately to some company or to a university on their teaching staff. Consequently, many were routinely, therefore, getting that certification and remaining here.

So, Barney and I sponsored an amendment which allows an exception to be made for people who have come from other countries to study in this country for particular types of studies. The high-technology field is the primary area, either for purposes of work or for purposes of working in the private sector, or purposes of teaching at our universities and colleges.

We did put a sunset on it, though, 5 years, and some say, why did you do that? I did it because I am not satisfied with the answers that I have gotten from our universities and colleges as to why they haven't done a better job of attracting some of our own youngsters, but particularly among our minorities.

I think it is wonderful, and I think it is appropriate that we have people from around the world that are in these positions, but it suggests to me that, at least in part, our educational institutions are not doing much of a job of making that same opportunity available to some of the minority communities in our country. I don't expect that to be cured in 5 years, but at least we wanted to find out in 5 years when we revisit it—and I am sure we will, and then I am sure we will enact some legislation that includes a similar type waiver—that both industry and our universities are at least concerned about that and are doing something about it.

You might ask me what are they going to do? I don't know, but it seems to me we ought to be doing a better job. The president of MIT testified before us and indicated the very good job they are doing in their undergraduate training program among minorities in this country, although it is less successful as they go into the higher studies.

I just say that as a background to a question, and that is: How essential is access to foreign talent; that is, foreign born graduates of American universities, to your particular companies and to your industry?

Mr. Berman.

Mr. **Berman**. The question is how successful has it been in acquiring foreign technical talent?

Representative **Lungren**. How important is foreign technical talent to your company and your industry?

Mr. **Berman**. How important is it, OK. To the industry it is extremely important.

The reason that the AEA was so excited that you and Barney backed that amendment, that change, comes from our eating our own seed corn—is that paying baccalaureate degrees in electrical engineering, computer sciences, and certain chemicals, and so on, so well to go into semiconductors and others of these fields right out of college drains the number of available professors for the colleges.

What Paul Gray said to us 5 or 6 years ago when we said, why don't you just increase the number of students that go through it? You have plenty of qualified applicants for course 6 and course 10 and 5, and so on. He said, well, I don't have the teachers.

So, one of the programs that we have is our companies contribute to a program, which we put in something like 17—or is it $20,000 per student per year to get doctorates if they will teach and forgive it as they teach.

So, the biggest source of the teachers has been the foreign students who are going through to get their doctorates.

It would have been really impossible without—and in our company, both in the R&D department, where we spent close to $9 million last year. That's in Massachusetts alone. It's just a collection of—it's a United Nations in there. As a matter of fact, the director of the department is Indonesian. There are a couple of Chinese extraction. One was born in China. And there is just everything else. All colors and backgrounds.

As in Peter's factory, if you go through our factories, you hear every language there is. And that's very interesting to hear the French-Canadian people speaking French to Asians. You know, you get everything, and it works.

So how important are the foreign people? Very damned important. And it's very shortsighted to erect barriers against immigration of any kind, thinking you could protect American jobs. That's crazy. It just doesn't work, in the first place. In the second place, it hinders industry more than it helps keep jobs. And a free flow of anything, whether it's money, resources, capital, people, talent, education, anything, a free flow of any of these things is what's good when you've got them?

Representative **Lungren**. Mr. Sarmanian.

Mr. **Sarmanian**. I think it's absolutely essential in some of the areas we were discussing that the continuation of these processes of immigrants—earlier it was said, talking about the basis of a country's growth—my father came here, and I'm the first born in this country, and I have no hangups of people speaking foreign languages or giving them an opportunity. Maybe that's why my company is successful in what it does with people. And I am convinced that if we don't continue in those areas, then the area of foreign competition eating into these basic industries that we're now successful in, will hurt us in the long run, because one of our problems is worker attitude that says, "I do not want those jobs."

Interestingly so, I think we've all seen where—and in the local area, we have a major newspaper, the Boston Globe. I believe last week's Boston Globe had 80 some odd or 90 some odd pages of want ads. I reflect to that, because I can recall years when there were only 10 pages. In my local hometown, we have a three-city newspaper, and I happened to read it last night and there were 12 pages of want ads.

So it tells you that this is a very important part of our company's growth of people, where we're to get them, what we're going to do with them and how we keep them.

You were talking about turnover rates. Turnover rates will be high when there's no unemployment, So go from job to job because the ante goes up at each time.

Representative **Lungren**. True.

Mr. **Sarmanian**. It has to.

Mr. **Berman**. And that's not bad.

Mr. **Sarmanian**. That's not bad; that's good. But it still creates the problem of what do you do to make your company grow, peoplewise. So we look to automation, process control, team organization, motivation, all the topics you were discussing earlier. We have to, because if we don't foreign competition will eat us up.

Last year, I spent 3 weeks in the Orient visiting the competition, people in my business, and I was absolutely shocked to see and to hear some of the things that they do differently than what we do. They have no waste treatment systems; we're forced to, and I agree we should have. And we put them in. They have a relationship with banks; the capital freely flows. We don't have that here. They also have little or no government innovation in creating business. Companies start up every day in Hong Kong in my business. I was shocked to see it, but I also learned from it. It said that I had better be a higher technology than what's being looked at there.

Mr. **Berman**. Do you mean innovation or intervention?

Mr. **Sarmanian**. Innovation. The Government doesn't bother them in Hong Kong or Thailand, as we——

Representative **Lungren**. It doesn't interfere with them?

Mr. **Sarmanian**. Pardon me.

Representative **Lungren**. It doesn't interfere with them?

Mr. **Sarmanian**. Doesn't interfere with their businesses and how they run them.

Representative **Lungren**. Mr. Ward, on the question about the foreign born——

Mr. **Ward**. Well, germanium is an arcane art. I mean, it was practiced 20 years ago by the major semiconductor manufacturers and all of the major semiconductor manufacturers have gotten out of the business, which is why we went into it. We are looking for 4 or 5 years for a qualified germanium engineer. We couldn't find one anywhere. Out of the blue came a call from a headhunter in Framingham who handles the Jewish underground railroad from Russia, and on our doorstep 2 days later was this immigrant from Russia who had germanium experience in Russia and has turned out to be absolutely super. I mean he's a legal immigrant. I don't mean to suggest he's illegal.

Mr. **Berman**. Illegal getting out of Russia. [Laughter.]

Mr. **Ward**. Yeah. I mean, terrific, you know, it worked out very well. It strikes me as odd that the United States should have a policy which on the one hand ignores the fact that we have 12 million illegal immigrants south of the border, and we're doing nothing about it. And you turn around and make laws that discourage educated people from coming into the country. I mean that strikes me as an odd juxtaposition of values. It's OK to let anyone swim across the Rio Grande by the millions, and yet when someone comes in here from India who's educated or is coming here and has gotten educated, we say, "Home you go, fellow."

Representative **Lungren**. The initial part of it had nothing to do with high technology or anything else. It just had to do with trying to rationalize the overall policy, and it wasn't until members of your industry came to us and indicated to us how important it was and how shortsighted it would be to affect it, in that way we made the change.

Let me ask you this, because there is the mobility of the employees that you have, and you say that you have to try and maintain them because they can up the ante by going somewhere else, what are you talking in terms of upping the ante now? What types of things do you find that attract and maintain your employees? You talked about the attitude. I've heard a lot about this, both in Sunnyvale and here. And I also found that, depending on which company you go to, there's obviously a different management style everywhere.

We went to National Semiconductor. They don't believe in offices. Nobody has their own office there. Even the chairman of the board sits in the corner of a big room with those partitions around. I've always found that rather difficult probably to make a private conversation. I guess you go somewhere else to make a private conversation.

We went to another place where they did have offices, but if you had offices, they didn't have windows, because they felt that was kind of something important, and those that only had partitions were around the side, and they got to see out. And they thought that was important about breaking down barriers between their employees. I went to ROLM. There senior management has offices, but they've got the best recreational facility I've ever seen.

Mr. **Berman**. In the world.

Mr. **Ward**. Isn't that something?

Representative **Lungren**. And then you go back to National Semiconductor and you find that in response to ROLM, they are in the process of creating a 14-acre recreation park for their employees. Evidently, it took some of the fellows who've been in that business a little bit longer, sometime, to believe that that's what they have to do to compete with ROLM.

What are some of the types of things that you folks are doing that quantify this family relationship or this concern that you have for your employees. I imagine it's different for each company, but I'd just like to sort of hear.

Mr. **Sarmanian**. I'll start by saying, I guess, it's a company culture and an attitude of belonging. The things that we do at our company is to be extremely open with our people, and we want them to be open with us. And I guess over the years have gotten that feeling that managment is not an adversary position but a position of belonging to the same group. Amazingly so, that as my 23d year in my own company, we now have second generation and several sons of parents who have worked for me who are now working in the company, because they feel it's a good company to belong to, the things that we do. They're all small, and maybe they make no sense to others, but I feel they're important. People get sick, we send flowers and fruit baskets. We have a lawyer on company time who comes and answers their questions. We're concerned about their mortgages, where they can acquire them. We help them with their medical problems. We're always open, because we feel a good company should have to become—they should become a part of us and we should become a part of them.

One of the items that we do, is we have a company picnic. And as I told you, we have 440 people. This summer we had 1,233 people attend our picnic. It has been a highlight for 20 years, and it will continue to be. People talk about it all year. We take pictures of our people working on the job and we post them in our corridors, because we feel that they should be recognized. Our customers should recognize them. Our company newspaper is now eight pages, and they write it, we don't. They talk about their softball team, their bowling team, who's having a baby, who got married. I think we've got—I can't tell you the untold number of marriages that have come directly out of our company.

It is a family attitude. When we said earlier we believe in the family basis, I think that's what makes the company viable for them and also for us. They feel that we are always concerned about them, and we don't cheat them. We're not pulling something over their eyes. They don't speak English, we try to speak their language. But we also tell them it's their job to learn English, and we send them to school to make sure they do.

I think it's just a feeling of belonging that makes them feel that they want to stay. And it is not always the case of getting more money someplace else. We've had many people actually say "I won't go to another company for more money. I like it here."

Representative LUNGREN. Mr. Berman.

Mr. BERMAN. Yes, well, I agree with Peter. I think that—you don't have quite the dramatic benefits like the ROLM athletic field facility, but—well, first, you do all the right things that I'm sure mature industries do too, except that you really do care about them, and you try and really do a good job. I think you could tell from Peter's—the way he says it, that he means it, and if the guy at the head of the company means it, why, the people at the bottom are going to feel it, because it does work its way down through.

So you start with your competitive benefits and pay. The progression in the company is strictly merit. You don't have the problems, as I said before of the barriers of rigidity.

In our company with two senior vice presidents, one who is mostly involved in marketing, who is 36 years old, and a product marketing person, and a year later he was in charge of the marketing department, and a year later than that, he was in charge of $100 million of sales.

So recognition, without restriction, worked. So you have, you know, the Christmas turkey, everybody gets. The awards you get for patents, service awards. We've developed a parallel ladder of growth for technical people, so you don't have to be a management person to be very highly paid. You can do that in the technical departments too. We have career development programs for those who want to build their careers or grow their careers or change their careers. Tuition assistance. And all the jobs are posted and exempt or nonexempt. All those other programs, like profitsharing, is every single person in the company. So that if someone is for getting 8 percent cash money totally from the company into a qualified program every year, and that grows, at some nominal rate, let's say 8 percent, again, you're in that company 10 or 20 years, there's a pile of money waiting for you either to be borrowed against or to use for retirement or for hardship. And it's an enormous amount of money. If a person has 2 or 3 years of pay, and some have a lot more than that, in that program, it's very significant.

I think basically the competition between these companies is good; it's not bad. The fact that there is employee mobility is great. It forces the companies to be great companies. And if you don't have progressive policies, your company is going to wither. I mean, you're talking to the successful ones. So the fact that a person can go from my company to his and improve his lot either in position and/or money, that's great. They steal from you more, you know. It's good. It works. So protection doesn't work.

Of course, back to some things that Roger Wellington and George Kariotis said, and that is, don't help us. You know, but try not to restrict us. The more limitations you put onto such things are a real problem. The taxing of moneys paid to an employee when he moves. I mean, it's very important to us to be able to take a person who's trained, let's say, in Watertown, MA, and send him to California or to New Hampshire or to Maine with his family to advance his career and our company and not have those moving costs and all the other costs, I mean, it's thousands to be taxable. I mean, that's a drain. That's antijob creation. Or even stealing or hiring people away from a company in another State that isn't as progressive as yours, and a lot of that stuff is taxable.

So that kind of help we don't need. And I think you know that. I don't want to beat you with it.

Representative LUNGREN. Mr. Ward, you said there's not much stroking that goes on in your company, but you indicated that you treat them as part of an extended family. Other than the flexible time that you mentioned, what do you think is unique to your company vis-a-vis the traditional companies of America?

Mr. WARD. Well, I'm not really sure there is that much unique other than the fact that I think by virtue of being nonunion, we have a lot closer contact with the employees than we would otherwise, and basically, we work with them, in terms of determining promotion and job opportunities to grow within the company, and so on and so forth.

I would add to what George Berman just said, in terms of taxing the moving things, it struck me as odd that you recently went after the educational benefits. It seems to me, if we're paying—we want our people to get educated, and if we're willing to pay for that as a fringe benefit, I don't see why it's in the interests of society or the country in general to tax those benefits. It doesn't strike me as that helps a whole lot.

We obviously don't do as many things; for example, as Peter does. Maybe we should. Our area is dominated by Wang, I mean, we're in Andover and Wang just blankets the area. And I thought we did a just super job telling our employees everything about what we do and who we are and where we're going and why we're not really lost, and so on and so forth. And I had a lineworker come to me one day on my way to the cafeteria and say: "Is it really true that you're Dr. Wang?" [Laughter.]

Representative **LUNGREN**. Some of those rumors continue.

Mr. **WARD**. Maybe we need a company newspaper. [Laughter.]

Representative **LUNGREN**. Well, let me ask this of the three of you.

What are the major financial incentives that you utilize, maybe not to motivate your employees, but some would say motivate to keep your employees that you think are important, that might be affected by action by the Congress one way or the other.

You mentioned moving expenses.

Mr. **BERMAN**. Stock options. They're absolutely great. The qualified—what do they call it now? The ISO's just work—they work great for a moderate-sized company like ours, because if we want either—you know, operating managers, marketing people, but especially technical people who are dead-ended in the enormous corporations, you know, they have benefit plans coming out their ears, and it's very hard for anyone to give up all those years of those. So you can use stock options to get them to take a job that's in their interest, the country's interest, and our company's interest by using those stock options, because we probably had 500 or 600 people in the course of time come through the stock option program in our company. We're a New York Stock Exchange company, and we have only 3,000 employees, of which probably 700 or more are outside this country, so they're not in it. So that really works. It really delivers the people.

This profitsharing, as I said before, is very important, and the rest of the stuff is the stuff that everybody has. But we mean it, and we try to do a good job with tuition assistance.

Representative **LUNGREN**. One of the things they stressed in our panels in California was the stock option. The idea, particularly from beginning, startup companies, where evidently a major means of compensation is to extend stock options to all employees. However, because of the way we've treated stock options in our Tax Code with sequencing and so forth, oftentimes, they're forced to sell it at a time they normally wouldn't. Then the whole idea of a stock option, in which you have an ownership interest in the company you're working for, and you will benefit if they succeed, is lost. One of the reasons is that stock options are generally thought of as something that large companies use for their top people and nobody else. And as a result, we don't realize it can be used, particularly in a high growth environment, as very much a part of the total compensation package.

Mr. **BERMAN**. It's always used. It's very important. It's not evil, immoral, or fattening for people to want to improve their financial lot. And the incentives, the motives that come from plain old money coming through, whether it's stock options or plain old pay and bonuses, awards or anything, are good. They're not bad. If anyone resents, whether it's Wellington or me or any of these guys, having personal fortunes of $5 or $10 to $20 million, they're really mad, because it was these same people who struck out and created all these jobs you're talking about.

And we're not looking for glory. We did it for the money. And that's not bad.

Representative **Lungren**. Well, you know, one of the things that came to mind in this whole working panel is that I come from southern California, and one of the communities I represent is called Signal Hill. Signal Hill is the second longest running oil find still producing oil that has been discovered in the United States. And people involved in the high-technology field, both the entrepreneurs—well, the entrepreneurs, primarily, remind me very much of this generation's versions of wildcatters. They have the same sort of attitude, which is, they're willing to go out and take risks. Their education level may be a little different, but we still have wildcatters in my area. And 1 year they're up and doing very, very well, and 2 years from now, they won't be doing well, because they've gone out and done their best, and they've just gone to some dry holes.

And that should be the nature of entrepreneurship. And so obviously, you have to have some financial rewards. These people, as much as they like to be in the outdoors, are doing it because they like the process of drilling holes. They like it because if they drill a good hole, they're going to make a lot of money on it.

Mr. **Berman**. Being dirty and not being with their family and all.

Representative **Lungren**. Let me ask the three of you this. You've indicated that you have rather good employee-employer relationships and that you strive to do so. How do you handle the dissatisfied employees? That normally is a mechanism that we see treated in many industries through the intervention of the union. In your cases, you don't have. How is that process developed? Is that something that you have to develop a skill for, a process for, something that's maintained?

Mr. **Sarmanian**. Yes; I'll address that. I again go back to that attitude and culture I say that permeates a whole company. And if we do have dissatisfied employees, we've found that the people next to them seem to tell us about it. When they do, as management, we feel it's our responsibility to take them and find out what their dissatisfactions are, what we can do to help solve, what we can do to make it better for their jobs, the people who work near them and the people who are around them.

I don't say we succeed every time. There are some people you are never going to satisfy, and no matter what you do, it doesn't make any difference. But what I do think that we have to do is address and communicate with your people that you're interested in their problems, and if you do this, then the level of dissatisfaction seems to reduce itself.

I think addressing wage benefits, reviews, personnel policies, medical insurance, all of these things that hit the bite of a person's pocketbook are part and parcel of their dissatisfaction and the quicker management addresses them, the less they have to be dissatisfied about. And when you do get that, I think you have to talk about it and make sure it's not a problem.

Representative **Lungren**. Mr. Berman.

Mr. **Berman**. I think perhaps the Congressman wants specifics, how do you handle it without a grievance procedure. Is that what you're after?

Representative **Lungren**. That's part of it.

Mr. **Berman**. Yes. Well, the companies have those, you see. In our company, for instance, we have an ombudsman system, where an employee can go to someone who's nominally in the personnel department, and that person will represent that problem to management, leaving the person himself out of it, you see, so he doesn't have to worry about that "Charlie Jones is a bad guy."

So you understand how that works. The other piece of it is that most of our divisions have regular—they call them coffee klatches, where representatives from the various departments—there will be different people each month, usually—will get together, not with the supervisors, but with the plant managers and people more on that level, closer to that level, and they just talk about everything.

Now the first time they're there, everybody's very ill at ease. You know, they're not going to talk much, but after this goes on for some months and some years, and they know you don't get penalized for speaking up or taking—or seeming to take management to task, but rather that management appreciates the usefulness of their suggestions and does take action. The people know more about what you need in the shop than you do, that is really the truth of it. And so those formal systems do work.

Let me see if there is any other one. Well, that's the biggest piece of it, added to what everybody talks about, the so-called open door policy. It doesn't work with all your managers, because all your managers aren't that damned open. We still have a few that are totally untransformed or unreconstructed, and they are pretty bad asses, I'll tell you.

Representative **Lungren**. And you have individual personalities.

Mr. **Berman**. But mostly, the doors are open, and they will listen to a complaint and get something done, and we try to get something done.

Representative **Lungren**. Mr. Ward.

Mr. **Ward**. Well, I think, from our perspective, the best way to deal with a dissatisfied employee is to avoid the creation of a dissatisfied employee, primarily through treating the people as fairly and consistently as possible. The source of almost all dissatisfaction is inconsistent treatment. I mean, that's usually what upsets children. It's usually what upsets adults. It's usually what upsets everybody. If people perceive themselves to be treated fairly and consistently, they rarely become dissatisfied. If they do become dissatisfied, they usually bring it to somebody's attention, and it gets dealt with.

We very carefully exit interview everybody who leaves the company all the way down to the lowest level, and typically, people who leave our company which are at the lower levels are leaving because of burnout. To work in the semiconductor industry has got to be the most boring job in the world. It's repetitive, it's dull. It never changes.

Representative **Lungren**. On the lower levels.

Mr. **Ward**. Oh, it's terrible. I mean, I have two sons who worked there while they were in college, and one of them had—one of the other people on the line came up and said, you know, "Do you like this job? Are you going to stay with this for the rest of your life," you know. And he said, "I felt like telling him, if I didn't have a good chance of being president someday, I'd be out at lunch looking for a new job." [Laughter.]

Representative **Lungren**. Do you have mechanisms where people can, from different levels, communicate with superiors, in terms of what job they are doing and improvements, and so forth?

Mr. **Ward**. It's not formalized, but the answer is yes. I never found any reticence on the part of anyone who worked for us to——

Representative **Lungren**. The reason I asked that is, we see so much in the national press about quality circles and things like that that Japan has and can we transfer them to the United States. You go to these companies in your areas, in the high-growth areas, high-technology field, and you find out they may be calling them something different——

Mr. **Ward**. But it's really very similar.

Representative **Lungren** [continuing]. But in terms of the output, it's the same thing, and it jsut goes back to my fascination with the fact that we have so many people eager to go to Japan to learn what they've done, when oftentimes, we've done it in our own way, and we don't have to question whether or not it can be transformed to our culture. The question is, can it be transferred from one company to another, because of the attitude of the management involved.

Mr. **Ward**. Well, the patron saint of the quality circle was an American, not a Japanese. They picked it up here.

Representative **Lungren**. I know. I think that's one of the ironies.

Mr. **Berman**. It's very effective in our company. I must submit that, you know, it's a lot easier with 125.

Representative **Lungren**. No question about it. I really understand that.

Mr. **Berman**. We're not carrying 1,000 people over there, you know, you have small groups. You have fewer layers of management, but you've got to have little more formalized stuff like the quality circles, and they meet at a particular time for particular purposes, and you do have the hotline. That's another one. An employee's family can call up and say, "You know, Joe is back on the sauce. You know, he's fallen off the wagon," and so we can know about it and help him without waiting for him to have an industrial accident.

Representative **Lungren**. Well, that leads me into another question, which is—and your company's a little bigger than Mr. Ward's, you've mentioned that before.

How does a company that has grown to your size maintain the entrepreneurial spirit? You know, a lot of what we talked about are these companies that start up, they're a few years old, they've had this tremendous growth. I suppose you could go back and look at the advent of the automobile industry and find similar tremendous growth at the beginning. Now we're talking about the problems that are visiting the automobile industry, because they've grown stagnant and like dinosaurs, and so forth.

Obviously, your industry is much younger than that. Your companies are much younger than that, but how do you attempt to avoid that. And let me just ask this. Is it because you're in a spirit of high growth—you're in an atmosphere of high growth, where competition is ever-present—that makes you do those things that are necessary?

Mr. **Berman**. Sure, that's part of it. We're in a competitive universe, and it's something that you don't even have to talk about. I mean, you don't have to say, remember, we're in a field that's very competitive or remember, we have to compete against the people in Macao and Hong Kong and Ireland, and so on and so on, so we must stay on top of things and stay ahead. It's in the blood. It's axiomatic. It does without saying. It's part of it. Did the automotive industry forget that? I just don't know that much about it.

How do you keep the spirit of innovation, the spirit of entrepreneurship in a company of our size? Well, hell, talk to Dean Wharton or John Young or Hewlett, they'll tell you how they did it in that company. As far as we're concerned, we do it by keeping the groups small, by having very few layers of management, by making it very clear that what we want are the so-called champions—if you've read the book—that we want these groups to take their own initiative and develop new businesses within our business. Our business, $200 million of it, the biggest piece of our business this year, the biggest one, is in the $30 million range. We're actually 20 different businesses, and you, as an employee or a manager, get paid a lot more and have a lot more prestige and recognition by striking off without the big boss telling you what to do, if you're running a more structured organized that only moves when it's told to.

I think that's how you do it.

Representative **Lungren**. Mr. Sarmanian, how do you maintain the entrepreneurial spirit, not just with yourself, but throughout your organization?

Mr. **Sarmanian**. Since we provide a service, we're not really developing a product, we manufacture somebody else's design. The things that we do are, yearly, we have what we call—it's like a worker fair, where we actually show our people what they've contributed in the last year, by showing them the changes in technology they've personnally been involved in. We also turn around and indicate where we stand in the industry we're in and make them realize that they're part of it.

I agree with George on the small groups of people to manage. We try and make them small. We try to get them involved in the area of showing them what products we produce. We actually bring pictures from our customers on their computers or the plane parts or the radar systems or a medical instrument. CAT/CAT systems, CAD/CAM's, and the CAT systems that we develop, or that our products are in.

So we're constantly using that in the media of educating them, to let them know that we are still a small company that's growing, and they're part of it. And they do feel part of it. And I think that's probably—because they feel such a part of it. They feel that they're not left out, and I think that the attitude of changing technology and our flexibility of management and what they produce for it keeps them interested in what we're doing.

Representative **Lungren**. Thank you. Thank you very much. I'd like to thank all three of you. You've been most generous with your time.

In California, when we held similar hearings, one reporter said, "Gee, this isn't fast-breaking news," or words to that effect, and my response, basically, is, we're not holding the hearings for that purpose.

One of the concerns I've had is that in making decisions in Washington, we like to think of macroeconomic policy and how it affects this sector or that sector, and we don't often think about how things are really done by individuals, both from a company standpoint and their employees. And I would just hope that we would spend a little more time doing that, because I'm absolutely convinced that many of the decisions we make on the Federal level do affect individual decisionmaking by individuals, whether they're employees or whether they're management. If there's any lessons out of Toffler's books and out of John Naisbitt's Megatrends, it is that we're moving toward a decentralized economy and society, which has many, many ramifications. One of them is, we're probably going to see me and more smaller businesses, or businesses that don't ever become the giants of the field. That's where many of the jobs, if not most of the new jobs are going to be created.

If that is true, or at least partly true, then we ought to be concerned about how our public policy decisions affect people in that area and how they affect the entrepreneur.

You have been of benefit, very much so, to me in this whole inquiry. I hope you have enjoyed it. I've certainly enjoyed it. We could go on and on with a whole series of questions, but as I say, you've been most generous with your time already, and I want to thank you for that.

Thank you very much.

[Whereupon, at 11:55 a.m., the committee recessed, to reconvene at 9 a.m., Friday, August 31, 1984.]

A ROUTE 128 PERSPECTIVE

FRIDAY, AUGUST 31, 1984

Congress of the United States,
Joint Economic Committee,
Washington, DC.

The committee met, pursuant to recess, at 9:04 a.m., in the Gardner Auditorium of the Massachusetts State House, Boston, MA, Hon. Daniel E. Lungren (member of the committee) presiding.

Present: Representative Lungren.

Also present: Robert Premus, professional staff member.

OPENING STATEMENT OF REPRESENTATIVE LUNGREN, PRESIDING (PANEL 1)

Representative **Lungren**. Well, good morning, and I thank my panelists for being here this morning.

This as you know, is one in a series of hearings we're having, both in Washington and in Silicon Valley and here in Boston, near Route 128, to try and discover, hopefully, some lessons that might guide public policy in the future, with respect to a high growth economy, and those types of things that the Federal Government might do or not do to allow an atmosphere for high growth.

Launching new companies and seeing them prosper and grow is the function of the entrepreneur in our free enterprise economy. The importance of entrepreneurs to our economy in an environment that encourages entrepreneurship and innovation cannot be overstressed. Without them, our economy would stagnate and the economic aspirations of millions of Americans would be frustrated. Nowhere in America, or the world, for that matter, is the entrepreneurial spirit more alive and vibrant than it is along Boston's Route 128 corridor, as well as Silicon Valley in California.

The spinoff of new companies from old companies and the creation of new industries and firms clearly sets the Boston area apart from other regions. This Joint Economic Committee is particularly interested in knowing more about the entrepreneurial climate in the Boston region and the factors that contribute to the startup process along Route 128.

Why is the Boston area such a fertile ground for this type of entrepreneurial activity? How does Government affect, positively and negatively, the entrepreneurial process? What can the Federal, State, and local governments do to encourage innovation and improve the Nation's entrepreneurial climate?

Questions such as these are the topics of today's first hearing on entrepreneurial startup activity in public policy. We are fortunate to have expert testimony on this subject from a panel of successful entrepreneurs who've gone through the startup process. They hopefully know what it takes to launch a company and to successfully nurture that company through the various growth stages and the lessons they have to tell us about what constitutes a favorable climate for entrepreneurship and innovation will be valuable to the committee, other Members of Congress, and the public.

One of the things we've tried to stress in this whole series of hearings is that oftentimes, on the Federal level, we look at economic analysis on the macrolevel and we rarely talk about the individual and what motivates or does not motivate the individual. One of the prime areas of our inquiry is, how does the individual entrepreneur react to different circumstances and what does the Government do or not do that might allow the entrepreneur to act in a way that is healthy for the economy, in a way that creates jobs.

We probably have all seen the studies that have come out recently to show that the United States has done a magnificent job over the last 12 years in creating jobs vis-a-vis the rest of the world, but yet if you look at the "Fortune 500" or the "Fortune 1000," those jobs were not created there. They were created in small- and medium-sized companies, many companies involved in high-growth areas and high technology, either having a direct or indirect influence on that.

We have the experience in California. I'm sure you may have it in this area as well, of Japanese industry representatives coming over to try and find out how America does it, at the time many in the Federal Government are saying we ought to go to Japan to find out how they do it. They're coming over here to see if they can capture part of the entrepreneurial spirit. Any maybe they can and maybe they can't. At least we in Government ought to take a look at what it is here and see how that may give us lessons from which we may derive principles for public policy in the future.

So I would ask if you could perhaps keep your comments to 10 or 15 minutes to begin with, and we could have questions and answers and hopefully get a freewheeling exchange here.

We'll just proceed then from the left to right and ask Mr. William Bowman, the chairman of Spinnaker Software Corp. of Cambridge, to begin.

PANEL 1. ENTREPRENEURIAL STARTUP ACTIVITY AND PUBLIC POLICY

STATEMENT OF WILLIAM H. BOWMAN, CHAIRMAN, SPINNAKER SOFTWARE CORP., CAMBRIDGE, MA

Mr. BOWMAN. My name is Bill Bowman, and I am the cofounder and chairman of Spinnaker Software, which is right next door to us here in Cambridge.

Spinnaker is the Nation's leading producer of computer software for the home. Before starting Spinnaker, I was the founder of Montrose School, a private independent day school for girls in Brookline, MA. Before that, I spent 4 years as a Federal Government employee in Rockville, MD, with the National Institute of Occupational Safety and Health. I learned an enormous amount during my stay at NIOSH, and I can honestly say that my Federal Government employment was a springboard to my life as an entrepreneur.

Let me take a few minutes and describe my company. As I mentioned before, Spinnaker is the leading producer of home computer software. Our company is 2½ years old and now has 121 employees. As I am sure you know, all the jobs created in the last decade have been created by medium- and small-sized companies. We had sales of $750,000 in our first year, which exploded to over $11 million last year. We are a profitable company and a taxpayer.

Our principal focus to date has been to provide educational software for children. Because most kids are in an unsupervised environment when they are playing with their home computer, educational software has to be fun or kids will turn to Pacman or some other arcade game. Therefore, we created the learning game format for our software which has become the industry's standard. I hope you have had a chance or will take the opportunity to play with some of our educational games which are being demonstrated outside in the hallway.

Spinnaker exists today because the venture capital industry exists. Our initial round of financing was provided by a Boston venture capital firm, TA Associates. TA funded my partner, David Seuss, and me, knowing that they were taking a chance. Neither David nor I had ever run a company, nor were we hardware or software technologists. Furthermore, each of us had a consulting background, normally an anathema to providers of capital to startup businesses. Nonetheless, TA felt that we might succeed and put up $800,000 to start the company. We were quite successful in our first 9 months but needed to raise an additional $1.5 million. We turned again to the venture capital industry where the money was again available. This past November we needed another $5 million in order to continue expansion, and once again, the venture capital industry responded. Finally, this past June, we concluded our fourth round of financing, $6 million, with pension funds that were recently permitted to expand their investments in small private companies. So we owe our existence to venture capital companies and the deregulated major pension funds.

If we are typical—and we are—it is important to ask the question: "What Federal policies permit venture capital funds to prosper?" There are two that come to mind: A low capital gains rate and low inflation.

A low capital gains rate is essential for the venture capital industry. The industry prospered during the 1960's, but during the 1970's, when the capital gains tax rate was increased, venture capital virtually dried up. Once it was reduced again around 1980, the industry again expanded and startup companies like Spinnaker prospered. A low capital gains rate results in startup companies like mine and raising the rate will start a substantial decrease in the number of such companies and the loss of jobs.

The second major factor influencing a good venture capital environment is low inflation. Venture capitalists and business men and women can more successfully gauge the return on their investment when inflation is low. During the roaring inflation of the middle 1970's, I spent half my time as a business consultant gauging the effect of high inflation on my client companies' profits. Since inflation has been reduced so substantially, I can honestly say that I have spent less than 5 minutes worrying about the impact of inflation on my business. This means I have much more time to devote to long-term strategic issues.

Low inflation is wonderful. Anything the Federal Government can do to protect low inflation will increase the number of successful companies.

I have watched the Government from the inside act in areas where it benefited our citizens and also in areas where it hurt them. I would suggest that to encourage startups, the Federal Government should concentrate on maintaining low inflation and a low capital gains rate. Beyond that, it should let the venture capitalists do the rest.

Having said that, let me discuss two areas where the Federal Government could really help companies like Spinnaker. The first is GSA: Help us to sell to the Government through GSA. The second is export policy; help us to more easily export our products to Europe and the rest of the world.

The General Services Administration could be a wonderful customer. Spinnaker sells lots of educational game software, which could fit into many programs administered by the various educational agencies with the Federal Government. Unfortunately, we have not discovered how to sell to GSA. It probably isn't hard. I remember the GSA vendor qualification requirements when I was a NIOSH employee, and they weren't at all onerous. However, few small businesses know how to sell to GSA. I would suggest that the GSA devise a marketing program aimed at small companies. Specifically, I would suggest that the GSA include a mail stuffer which would include an application for companies to become suppliers to the GSA. Such applications could be included in the quarterly IRS tax mailings. Companies who never heard of GSA could complete the application and eventually qualify as a GSA supplier. Having solid customers like GSA is very important to small companies, especially in the early years.

The Government could also help us by streamlining the export system. Right now it's very difficult, because of the strong dollar and because the Federal Government is so concerned about technology exports. I love the strong dollar and am willing to suffer under it, but I really wish the Government could help us in streamlining other aspects of the export system.

The Federal Government is extremely sensitive about the export of computer software, as it should be. Our strategic position will suffer, if defense-oriented software is exported to unfriendly nations. However, there is a vast difference between defense-sensitive software and educational software for children. Eventually, the Government will recognize this, but in the interim we are suffering because we are included under the same regulations as defense-oriented software. It takes as much effort for us to export "Facemaker," which is an electronic version of "Mr. Potatohead," as it does another customer to export software that guides missile trajectories.

If the Government could move more quickly toward recognizing the difference between educational software for children and missile trajectory software, we would be much more successful in helping our country maintain a balance of trade.

In addition to these two actions that would directly benefit Spinnaker, there are two-related initiatives that would benefit high-technology startups in general. The first relates to the R&D tax credit, the second to equipment depreciation rules.

Under current law, the R&D tax credit can only be claimed by companies that already exist. It is not available to startup. It seems silly that IBM can get a tax credit for esoteric research designed to further their grip on the computer industry, but a startup which is fledging might come up with a brilliant idea, but still is denied a tax credit for research. Making the R&D tax credit available to startup would be very beneficial.

The second suggestion involves depreciation rules. The new, accelerated depreciation rules are a great improvement over the old procedures, but even the 3-year schedule is too long for many types of high-technology equipment. Personal computers, for instance, become outmoded every 18 months to 2 years. Creating a new category for certain high-technology equipment would help.

In summary, I think the Federal Government can help entrepreneurial companies most by maintaining the current capital gains rate and low inflation. It can help us further by acting as a good customer through the General Services Administration and helping us export our products to foreign countries. Changes in the R&D credit and ACRS depreciation rules would also help. I know I share the beliefs of many fellow entrepreneurs when I urge the Federal Government to resist the temptation to become further involved. The private market system is fully capable of launching startup companies like Spinnaker Software.

Thank you again for coming to Boston to listen to our view, and I hope we will help you in thinking about ways to support the growth of startup businesses.

Representative LUNGREN. Thank you very much.

Now we will hear from Mr. Alexander d'Arbeloff, president of Teradyne, Inc., in Boston.

STATEMENT OF ALEXANDER d'ARBELOFF, PRESIDENT, TERADYNE, INC., BOSTON, MA

Mr. D'ARBELOFF. Thank you. First let me tell you a few things about myself. In 1960, together with a partner who was a classmate at MIT, I founded the company of which I'm now president, Teradyne. Teradyne is now the world's largest independent manufacturer of automatic test equipment for the electronics and telecommunication industry. We employ about 4,500 people in plants in Massachusetts, New Hampshire, California, and Illinois. And we have sales offices around the world.

Our sales this year will be well over $350 million, up from $250 million last year and $175 million the year before.

My partner and I started the company in rented space in downtown Boston, using $25,000 of our own money and $10,000 each from 10 private investors, and they were chiefly relatives and friends. A little later, we turned to American Research & Development, a venture capital firm, for an additional $150,000. We went public in 1970 and have since financed our growth through earnings, debt, and occasional public offerings.

Perhaps more immediate relevance to these hearings is the fact that I am also a director of Lotus Development Corp. and Stratus Computer—Bill Foster's here—two successful startups in recent years, as well as several small companies that are still privately owned.

As I understand it, you're interested in hearing how Government policies influence the climate for innovation and entrepreneurship, but before I get into that, I'd like to spend a minute defining terms. Innovation and entrepreneurship are not synonymous with startups. While everyone would agree that startups play an important, maybe vital role and are to be encouraged, we would also agree. I think, that a great deal of innovation and entrepreneurship takes place in existing companies and that Government policy should encourage such innovation wherever it takes place. Moreover, startup is a startup only once. Thereafter, it faces years of struggle, of building an organization, a distribution system, a service network, before it can really call itself a company of substance.

This process of company building, no less than it encourages the start of companies, otherwise who will ever build the future IBM's and Hewlett-Packards, we all depend on to provide the real muscle in a national competition.

The two key ingredients in the entrepreneurial process are talent and money. Money in general has been available since the reduction in capital gains taxes in the late 1970's and probably will even be more available if capital gains are further reduced.

So for those startups that get off the ground, the tension shifts to the other key element—talent. The handful of people who started the company can take the enterprise only so far before needing the help of experienced hands, for such people are already employed. So the young company must persuade them to leave the security of positions with established companies. As long as the company is private, talent can be attracted to distribution of stock or stock options with a promise of substantial gains, once the company goes public.

Teradyne, for example, was able to attract most of what is now its senior management in the 2 years before its initial public stock offering in 1970.

Sooner or later, most growth companies must go public, mainly to finance their growth, but also to value the holdings of shareholders and employees. The faster the growth, the greater the pressure to bring in additional equity capital, since few companies can price high enough or borrow enough to fund rapid growth for very long. But once the company does go public, it crosses a dangerous threshold. At the time when it's probably experiencing its most intense growing pains, it suddenly loses much of its ability to pay for talent.

Stock options must now be pegged to market value to qualify for favorable tax relief and future gains are much less certain than they were before the public offering. Still stock offerings have enormous built-in advantages. They're very popular with employees. A company can use them to attract and hold talent without penalizing earnings, and the only cost is some small dilution, typically 3 to 4 percent a year in the value of existing stock. And there's no cost whatever unless the market value of the stock increases.

Looking at it another way, if the value of Teradyne stock increased by $100 million a year, we asked our stockholders to give $3 or $4 million to the employees who were most responsible for the increase. If the stock value does not increase. the options are worthless. For the stockholders, for the company and for everyone concerned, it's clearly a win-win situation.

At least that's how it operated until the mid-1960's. Today, however, our company stock option programs have been weakened by tax law changes, and companies like ours are seriously handicapped in the competition for talent. The payoff is still there for those who start companies. The tax laws have not diminished the values of common stock, and the private company still have the tools it needs to attract talent, but recent changes in tax laws have stacked the deck against public companies.

I do not believe that is an intent of Congress. I imagine that you would all agree that the tax laws should be neutral in this respect, but that's how it's worked out.

The first blow was struck when Congress decided only one class of options, called incentive stock options or ISO's, would qualify for favorable tax treatment and that a company could distribute no more than $100,000 worth of ISO's in 1 year to any one person. Well, you may say $100,000 is a lot of money, but the $100,000 is not a gain. It's simply the number of option shares times the option price, which is market value. For example, if I give you options on 3,000 shares of Teradyne stock at today's market value of $33 a share, I get the limit, yet your present gain is zero. If the stock increases 25 percent, you'll make about $25,000 before taxes, which is a long way from $100,000. More important, it's a long, long way from the gains available to people starting companies or joining companies that have not yet gone public. The payoff in those cases can be measured in the millions taxed at normal capital gains rates, at present, a maximum of 20 percent.

Looked at it in this context, an annual limit of $100,000 imposed a difficult recruiting handicap to the public company and it falls far short of what's needed to attract the key people, needed to strengthen or realign management in critical periods.

The second blow was struck when Congress decided to make the paper gain realized on the exercise of an option subject to the alternative minimum tax. Now fairness dictates that no gain should be taxed until it's realized, yet in certain cases, because of the alternative minimum tax, employees who exercise stock options are forced to sell their stock to pay for the alternative minimum tax. Moreover, the effect of the alternative minimum tax is to increase the potential tax rate well above the normal 20-percent capital gains maximum.

So with a one-two punch, Congress has first severely limited the number of options that can be given and then raised the potential tax rate on the payoff. It also has turned the execution of an individual stock option program into an unbelievably complicated process.

It gets even worse. Sequencing rules make it illegal to exercise one option until all prior options have been exercised. The employee exercising an option must hold the stock for 1 year to qualify for long-term capital gains, even though he may have already held the option for several years and even though the holding period for outside stockholders is only 6 months. In addition, officers of our companies are subject to a law known as rule 16D that prohibits any purchase of stock, including option exercises within 6 months of a sale or vice versa.

Putting it all together, the incentive stock option limits the alternative minimum tax, the extra holding period, sequencing regulation, rule 16D, today's stock option program defies rational explanation. We've been crushed under the weight of endless tinkering and our publicly held companies have lost the benefit of one of the most brilliant and least costly incentive schemes ever devised.

I think there's a simple solution to all this. I suggest the creation of a new type of stock option designed specifically for those companies that distribute options to at least 10 percent of their work force. Such broad participation is characteristic of most of our growth companies. To prevent abuse, I would further insist that no single employee could receive more than 10 percent of the options given out in any 1 year.

For those companies meeting those tests, I would restore the advantage the stock option enjoyed 20 years ago. There would be no arbitrary limit on the amount of options given out beyond those imposed by company shareholders. Paper gains on options exercises would be taken out of the alternative minimum tax computation, so that the maximum tax on option-related capital gains is the same as that on other capital gains. And I would also suggest that for all options held at least 3 years, any gain on the sale of the stock would be subject to the long-term capital gains rates without regard to the holding period of the stock itself. Again, officers should be exempt from 16D on option exercise only.

I've dealt at length on this subject of stock options because options represents a golden opportunity to motivate the most creative and most productive members of our work force. These people who risk their careers on new enterprises and new ideas must know they'll receive a fair share of appreciation of stock values that their labor and creativity bring about and existing companies must be able to hold critical talent. Otherwise, we'll see endless fragmentation of effort with few companies able to achieve the scale necessary to become international competitors.

Spinoffs are worth encouraging and indeed, are encouraged by present tax laws. The innovators who decide to make their contribution within the frameworks of existing companies deserve no less consideration.

Finally, the logic of my proposal is especially compelling in the light of current controversy over executive compensation. Critics have charged it is often not related to performance. The value of stock options are related to performance, not perfectly and certainly not on a day-to-day basis, but more rationally than any other measure available to us. The stock market, over an extended period of time, is an excellent arbiter of value, both of economic value and of the value of the company to society. And those who believe rewards should be pegged to performance can find no better instrument for linking the two than the stock option.

In my judgment, Congress can do nothing more immediately helpful to our growth companies than restore the appeal of stock options. I hope you'll use your influence to move your colleagues in that direction.

Representative **Lungren**. Thank you very much.

Now we'll hear from Mr. Paul Severino, the chief executive officer of Interlan in Westford.

STATEMENT OF PAUL SEVERINO, CHIEF EXECUTIVE OFFICER, INTERLAN, INC., WESTFORD, MA

Mr. **Severino**. I'd like to start by telling you a little about Interlan.

We started the company in 1981, May of 1981. The company was founded with venture capital, and we have had since two rounds of financing for a total capital investment of about $5.5 million. And we've financed the company mostly through venture capital together with private funds.

We have about 155 employees today. The first full year of revenue was 1982, which was $2.5 million. Last year we did $6.7 million. And for the first 6 months of this year we did $8 million. So we're growing at a very good rate.

What we're here to talk about today, though, and examine is the exciting and, I believe, uniquely American process of the entrepreneurial establishment and growth of high-technology companies. In my travels around the world I've constantly been reminded of the fact that the ingredients necessary to foster and support this growth are nowhere as abundant and as widely available as they are in the United States.

Some of the ingredients are intangible; they're basically a part of our culture. This Nation was founded by people who were unafraid to take risks. Today that spirit of risk-taking is still here. It's alive and well along Route 128 and now 495, where we're located, and also in Silicon Valley.

Some of the ingredients are tangible. Venture capital is available to fund the risk-takers. Basic research is funded by the various Federal agencies and is placed in the public domain to be integrated into products which are being developed by startup companies. In our own case, in Interlan's case, we actually use a lot of the technology that was developed for the Defense Department Armnet, and it's being used commercially now in many of the applications, including IBM, Digital Equipment, and many of the bigger companies.

There are Government tax and investment policies that provide favorable incentives tp encourage this profitable growth of entrepreneurial companies.

While the basic ingredients for success are available to anyone anywhere in the country, the fact remains that two areas of the country have emerged as major centers for the creation and growth of the high-technology business.

It is my belief that these areas possess a unique balance of attributes, what I would like to call a "high-tech ecology." As with any ecology, it is important to understand how it must be nurtured, in order to maintain a proper environment for growth, and also to understand that it is very difficult to artificially recreate the ecology in an area not naturally suited to support it.

Let's look at the key components of this high-tech ecology. First, there must be an intellectually fertile source that produces a constant stream of ideas that spawn new companies. Nationally prominent educational institutions are on important starting point. But equally important is the Government-funded research that is performed in these institutions. The institutions must be located in an area that augments intellectual stimulation with an equal measure of culture stimulation and broad lifestyle alternatives.

In short, it's got to be a nice place to live, not just visit. The academic environment must be supported by major technology companies that provide a conduit of employment for graduates and also a source of technology exchange to further the research efforts of these schools. Companies that come to mind are Digital Equipment Corp., Polaroid, Data General, Fairchild, National Semiconductor, and Intel. The diverse markets served by these companies encourage new product development opportunities which trigger the spinoff of talented individuals to form new companies. These companies develop products based on the latest available technologies.

In order for these new companies to flourish and grow, they also need a population density large enough to provide a labor pool necessary for the manufacture of the products.

Government policies that interfere with the interplay of these forces can quickly damage the high-tech ecology. On the other hand, there are opportunities, such as the funding of research and the facilitating of this technology transfer, that can be positive forces for growth. It is not clear to me whether Government programs intended to foster a high-tech ecology in the areas of the country that are not inherently well-suited to support it would be successful. If any of the key ingredients are missing, there is not a high probability that the startup process will occur at all. We do, however, see progress in areas like Atlanta, Houston, and Dallas which are apparently capable of supporting this high-tech ecology.

In terms of basic elements that could adversely affect the ability to start new companies: First, a strong, growing, and stable national economy is essential. Second, any increase in the capital gains could easily cause a major shift of available capital away from this type of investment. The present tax has worked very well.

Finally, increased participation in almost all market segments by the dominant players has been a deterrent to both investors and entrepreneurs alike. This is a relatively recent phenomenon, and it's something that can have far-reaching effects on future startup activities.

In closing, I would like to say that the ability to take an idea and grow that idea into a thriving, profitable major corporate entity is one of the most challenging and rewarding experiences in this free enterprise system. It is truly an all-win situation—employee, investors and the Nation all benefit.

Thank you.

[The following factsheet was attached to Mr. Severino's statement:]

INTERLAN

INTERLAN, INC. FACT SHEET

CORPORATE OBJECTIVE:	Interlan designs, manufactures and markets, Ethernet-compatible data communications products and systems that provide standardized interconnection, communications management, and compatible information exchange in a multi-vendor, local area information processing environment.
HEADQUARTERS:	3 Lyberty Way, Westford, MA 01886 Tel. (617)692-3900
FOUNDED:	May, 1981
INVESTORS:	J.H. Whitney, Oak Investment Partners, Continental Illinois Venture Capital, Alex Brown and Sons, Sutter Hill Ventures, New England Capital, Montgomery Securities, Kyocera International.
DIRECTORS:	Russell E. Planitzer - Partner, J.H. Whitney J. William Poduska - Chairman, Apollo Computer Michael D. Kaufman - Partner, Oak Investment Partner Paul J. Severino - President, Interlan, Inc. David Rowe - Vice President, Interlan, Inc. Jerome Jacobson - President, Economic Studies, Inc.
OFFICERS:	Paul J. Severino - President Patrick Clark - Vice President, International Operations Gabriel A. d'Annunzio - Vice President, Marketing Raymond Moore - Vice President, Engineering David Potter - Vice President, Research and Advanced Development David Rowe - Vice President, Finance Allan Stevens - Vice President, Manufacturing
EMPLOYEES:	153 as of 8/1/84.
FACILITIES:	35,000 sq. ft. for manufacturing, engineering and headquarters staff, expanding to 102,000 sq. ft. by 12/84.
SALES CHANNELS:	Domestic - 7 direct-sales offices, 11 Independent Sales Organizations with 31 offices. International - 11 distributors covering 13 European Countries, Canada, Australia, Israel and Japan.

PRODUCTS: Local area networking hardware, software and accessories compatible with IEEE 802.3 and Xerox Ethernet standards. Marketed as the Net/Plus System; an integrated family of over 30 hardware and software products supporting host-to-host, terminal-to-host, and device-to-device (including PC's) communications and compatible information exchange in a multi-vendor, local area environment.

- Communications Controllers - Plug-in, high-performance Ethernet interface devices for Digital VAX, PDP-11 and LSI-11 Computers, Data General NOVA, Eclipse and MV series computers, Multibus-compatible 68000, 8086 and Z80000 microprocessor systems and IBM PC, IBM PC/XT and IBM PC-compatible personal computers.

- Programmable Network Processors - for VAX, PDP-11, LSI-11 and Multibus systems high-performance, intelligent Ethernet controllers that offload host systems from protocol processing activity. Both XNS and DOD IP/TCP protocols are supported on the board, as well as the option to program specialized user-written protocols.

- Networking Software - Internet Transport Protocol packages, based on Xerox Network Systems Architecture, reside in host computers or on Programmable Network Processors that are on a single Ethernet or multiple Ethernets linked via long-haul networks. ITP Packages support compatible communications among computers running under control of VAX/VMS, RSX-11M(+), 68000/UNIX System V, AOS/VS and MSDOS operating systems. DOD's IP/TCP protocols run on Network Processors installed in systems using 4 2BSD UNIX and UNIX System V Operating systems.

- Application Software - Network File Server Protocols that serve as a basis for transmitting user-written applications programs (e.g. Print Server) over the network and allow users of VAX/VMS, UNIX System V, and MSDOS operating systems, to manage and transfer files of information.

- Network Management Software - Menu-driven system can reside on any system in network running Interlan Internet Transport Protocols (does not require dedicated computer) and provides network manager with detailed network performance statistics for any station on network (distributed as part of XNS/ITP package).

- **Network Terminal Servers** - NTS product family provide "data pbx" services and Ethernet interface for any RS232-C asynchronous devices. Up to eight devices, including terminals, personal computers, printers, computer ports and modems, can be attached to a single terminal server. Any number of NTS's can be interconnected via an Ethernet coaxial cable.

- **Integrated Network Terminal Servers** - The newest member of the NTS family, the integrated NTS provides a direct link to Ethernet for VAX/VMS and Multibus/UNIX System V hosts. This hardware/software package replaces 4 DMF32 or DZ11 asynchronous controllers, cables, and (4) outboard NTS10 Terminal Servers with a single 32-port connection to Ethernet.

- **Ethernet Direct Connect** - A direct connection to Ethernet for IBM PC, PC/XT and IBM PC-compatibles. Provides a high-performance Ethernet interface and complete transport-level communications service based on the Xerox Network Systems Architecture.

- **Internetwork Software Links** - couples user services of Digital's DECnet or Data General's Zodiac to Ethernet with full logical connectivity and 10Mb/sec data communications service.

- **Accessories** - Single source for Ethernet transmission products including non-intrusive tapping Ethernet/IEEE 802.3 transceiver, cables and connectors.

- **Personal Computer Networking Software** - Terminal emulation and file transfer of software packages support MS-DOS and CP/M compatible PC's connected to Ethernet via Network Terminal Servers.

TS:

- o System integrators requiring multi-vendor flexibility, a standardized method of high-speed, host-to-host, and work station-to-host communication, and compatible information exchange within multiple operating system environments. Typical system integrator products include: systems for CAD/CAM, CAE, ATE, medical imaging and text composition.

- o End users requiring an open-ended, low incremental cost network providing extensive "data pbx" and management functions and compatible information exchange for up to several thousand terminals and computers from a variety of vendors. Typical application environments include universities, engineering, and software departments, corporate OA systems.

MERS:

As of 8/1/84 the company had over 500 customers, with 45% classified as system integrators, 5% OEMs and 50% end users.

Typical system integrators include:
- Apollo Computer
- Calma Corporation
- Daisy Systems
- LTX Corporation

Typical end users include:
- Sanders Associates
- University of California
- McDonnell-Douglas
- RCA Corporation
- Standard Oil (Ohio)
- Tektronix

CHRONOLOGY OF MAJOR EVENTS:

5/81	Incorporation
11/81	Announce Unibus Ethernet Controller
1/82	First Shipments to customers
2/82	Announce Q-bus Ethernet Controller
4/82	Announce single-board Multibus Ethernet Controller
5/82	Announce first DECnet-to-Ethernet link
9/82	Ship first passive tapping, Ethernet transceiver
11/82	Ship first Xerox network systems-compatible, internet transport protocols
1/83	Ship first Ethernet controller for Data General computers
7/83	Achieve profitibility
8/83	Announce NET/PLUS, featuring NTS-10 Network Terminal Server and PC Networking Software
4/84	Announce Multibus Ethernet controller with UNIX networking software
4/84	Announce Data General marketing agreement for linking Ethernet to Xodiac network
5/84	Announce second generation Multibus Ethernet Controller
5/84	Announce XNS networking protocols for UNIX System V
6/84	Announce Ethernet/IEEE 802.3 transceiver
8/84	Announce Integrated Network Terminal Server for VAX/VMS Systems (INTS/VMS)
8/84	Announce Programmable Ethernet Network Processors for Unibus, Qbus and Multibus systems; both XNS and IP/TCP protocols supported
8/84	Announce XNS networking protocols for MSDOS
8/84	Announce Ethernet Direct Connect, transport-level service under MSDOS for IBM PC's and XNS/ITP
8/84	Announce XNS networking protocols for Data General AOS/VS
8/84	Announce File Server Protocols with file transfer capabilities for VAX/VMS, UNIX System V and MSDOS

Representative LUNGREN. Next, we will be privileged to hear from Mr. William Foster, president of Stratus Computer.

STATEMENT OF WILLIAM FOSTER, PRESIDENT, STRATUS COMPUTER, NATICK, MA

Mr. FOSTER. Thank you. It is a pleasure to be here, and I have a little bit different perspective. I am naturally a laid-back Californian disguised as a Boston businessman.

I was educated in Silicon Valley, and I spent most of my professional career in Silicon Valley, but I chose to start my company here in 128. The reason is people, which is the most important ingredient in starting a company. In my case the type of talent I needed existed here, not in Silicon Valley.

There is really, I believe, three different ingredients involved in starting a new venture. One is you need an idea. Second, you need people. And third, you need money.

And there are plenty of ideas around, and there is not much, I don't think, the Government can do to encourage more of them. I think the two areas to concentrate on are people and money in terms of how you form more 128's and more Silicon Valleys.

And again, for my business, which is building large computer systems, there is really more computer systems engineering talent in the 128 area than there is any place else in the world. Silicon Valley is more oriented toward components and smaller systems. So this was the obvious choice for me to start this company.

How do you form other 128's? Well, first, you need to have an area that is attractive for established companies to expand into because by and large young companies are staffed not by people directly out of universities but by people out of other established companies because generally universities don't teach engineers how to manage projects and get things done on time. They teach them to think, but they don't teach them to be results oriented to the degree that you can get products out successfully.

So we, the small companies, inevitably wind up hiring people from big companies. So again, you first need an area where big companies are going to expand into and then after several years there will be a base experience that is available for smaller companies.

And after that happens, obviously you need money. Financial centers need to be there both for the venture capitalists to invest in the company and for the entrepreneur to make money. Financial centers are very key.

My opinion, in looking around the United States right now as to the next possible 128 areas, are places like Research Technical Park in North Carolina. There is an excellent base of talent there. There is an excellent university system for the large companies to draw their people from, and it has a very attractive cost of living.

Another area is Austin, TX. Austin, TX, until 6 or 8 years ago you couldn't have used as an example of a possible next Silicon Valley because it really wasn't until 6 or 8 years ago that big companies like Data General, Intel, and Tandem began expanding into Austin. Now, there are base people there that are available to spin out and start young companies, and again a favorable cost of living, good university system close by.

Another area might be Boulder, CO.

California is a little bit tough because most places in California violate the rule as an attractive place for a large company to expand to because of the high cost of living, particularly the high cost of housing. But I would say two possible areas in California might be Roseville and possibly San Diego as the next two expansion areas. But big companies don't expand generally into the Los Angeles area or Silicon Valley because you can't attract specialists into that area. It is just too expensive there to buy a house to go build a company.

So the results of all of this startup activity is innovation. In my business—again, which is somewhat different from some of the others here, my business being computer systems—I feel that most of the real innovation that has taken place in the last 20 years has come from startups, not from big companies. So obviously encouraging more startups is very important in terms of continued progress in this innovative product.

Why startups? Well, we have nothing to lose. You know, people who start companies are willing to take much bigger risks than big companies. Big companies generally become risk averse for various reasons, partly because of the public pressures of Wall Street.

Examples of why I feel that real innovative ideas have come out of younger companies in my business in terms of new technologies: Prime Computer, which started in this area in 1972, was the leader in what we call a 32-bit super miniflat system. It wasn't until after Prime did this that established companies like IBM and Digital Equipment and others followed suit.

Another example in the area we are in, which is fault tolerant computers, is Tandem Computers that started in 1974 in Silicon Valley. They were the leader, and they were the first company to offer commercially available—what they call nonstop or fault tolerant computers, and it wasn't until after they became established that other companies like IBM, Dual Pac, and DEC began looking at this.

There's examples in which startups have not only created companies but entire industries. Apple is a good example. Apple created the personal computer industry. It wasn't IBM. IBM followed Apple.

Intel created the microprocessor industry, and of course in our industry the most important startup of all was Digital Equipment back in 1957. It started the minicomputers.

So the encouragement of startups can be much more far reaching than just fostering the growth of an individual company. You can actually create entire industries.

So in summary, in terms of creating more of these areas, you need a tracking environment for established companies to expand into, which means a good low tax base, a low cost of living, and a good quality of life.

You need to provide the financial incentives for venture capitalists to make money, which primarily boils down to a low capital gains tax, which is one of the real explicit examples of how lowering taxes is beneficial.

You know, as I understand it, when the capital gains tax was raised in the late 1960's the capital gains revenue actually decreased because people weren't taking long-term capital gains after that. It had the exact opposite effect of what Congress had hoped. And once the capital gains tax was lowered in the late 1970's, venture capital became available once again.

My company would not have been started if the capital gains tax hadn't been lowered.

And also you have to provide the financial incentives for the entrepreneurs and for the employees, such as stock option plans that Al talked about.

Very briefly on Stratus, we started in 1980, a $1.7 million investment by three venture capital firms. We have been leveraged into a company that has produced $42 million in sales.

We develop systems that don't fail, fault tolerant systems. These systems have benefits not only to other companies but to general society. For example, our systems have been sold into some very important national defense applications that will help everybody in the United States.

We have now 330 people working for our company, but we have probably created about 500 other jobs indirectly through subcontractors that are working for Stratus. So the leverage of one company is incredible in terms of the business that it provides to many others. Thank you.

Representative LUNGREN. Well, thank you very much. I appreciate hearing from all of you, and let me just ask one question. Maybe you can't give a specific answer to it, but at least I would like to ask the question to find out what people think about this.

Do you have any idea why you have the phenomenon here in Route 128 and Silicon Valley but you don't have it in Chicago, IL, where you have presumably got outstanding educational institutions and you had some capital available? Evidently, it wasn't very venturesome. You had the beginnings of the high-tech industry. You had strong electronics firms there following World War II.

Why here and Silicon Valley and not there in some other places?

Mr. FOSTER. I believe you have to look at what happened in those two areas, and it is very hard to generalize. Silicon Valley goes back to the Frederick Turman of Stanford, who created Hewlett-Packard. He got Bill Hewlett to pull Dave Packard back from GE in Schenectady and started that company. Barry and Fairchild. There is a lot written about how that individual had a lot to do with getting that area started. And then you had a base of talent that was available when the money became available to start companies.

And here you have DEC and Wang in the 1950's and Polaroid that have expanded beyond that. You have to start with that base of talented companies.

Again, in Chicago, you know Motorola was there, and there are some high-tech firms, but not nearly the same concentration as you have in these two areas.

Representative LUNGREN. You didn't have the activity; you didn't have the spinoff there.

Mr. FOSTER. Yes.

Representative **Lungren**. I guess what you are saying is what someone said: You need role models in certain areas, and——

Mr. **Foster**. There is no way you can guarantee it can happen everywhere.

Representative **Lungren**. No, I understand that.

Mr. **Foster**. Someone has to start and develop some successful companies.

Representative **Lungren**. Yes, sir.

Mr. **d'Arbeloff**. We have a subsidiary that we started from scratch as an entrepreneurial—you know, two guys that worked for us wanted to live in Chicago. But anyway, they started this company, and it is now a very successful $50 million subsidiary, and we have had very good luck starting in Chicago. It is north of Chicago, Northbrook. So it can be done there.

But I agree with what Bill said—and I think what you said—there just wasn't enough of high tech going in the late 1950's, early 1960's to provide the kind of thrust that was needed.

Representative **Lungren**. And I am really trying to get sort of two levels of inquiry in these hearings. One is can you have some other Route 128's around the country, and, two, even if you can't or even if it will just be in a few places, what lessons have we learned here that could be generally applied as far as public policy is concerned to create an environment which may engender a national high-growth strategy without specific Route 128's or Silicon Valleys?

And, Mr. Foster, you suggested that perhaps there are some areas where you can replicate 128. Do any of the rest of you have ideas on that, whether that is possible and whether that is something that we may be seeing in the near future? Mr. Bowman.

Mr. **Bowman**. I grew up in Milwaukee, went to school in Chicago, and so I might have been expected to look at that area when I started Spinnaker. But it is just too cold. That is one of the real reasons. It is not a fun place to live.

Representative **Lungren**. So you came to Boston for the heat?

Mr. **Bowman**. I came to Boston because it is 20 degrees warmer here, which isn't really well understood. I think the real big reason, though, are universities. Chicago has the Unversity of Chicago. It has Northwestern. It has the Circle Campus of Illinois. But none of those are big engineering schools.

I graduated from Northwestern in the engineering school, and that is a good school, but it is—it is a terrific school in some aspects, but it is not real big. There just aren't the numbers that come out of a school like MIT. And if you don't have universities and you don't have a real attractive climate or an attractive cultural environment, I don't think you can do it.

Representative **Lungren**. Yes, Mr. Severino.

Mr. **Severino**. One thing you need to look at, though, is what happened 20 years ago and what has happened today. Twenty years ago, what spawned the Boston area, it seems, is a lot of the defense research that was being done in places like Lincoln Labs and MIT. In fact, Ken Olson, who was the founder of DEC, came out of Lincoln Labs.

But today, you know, a lot of the entrepreneurs and people that I—friends of mine that are starting companies in this area have not had that experience. They started working for the DEC's and the Primes and the Data Generals of the world and have spun off. So there is sort of a second generation going on in the Boston area of spinoff companies. Even though maybe they don't compete with the companies they left, they sort of learned how to do it from the companies they worked for.

I think, Bill, you were at Data General, weren't you?

So there's two things going on, and what happened 20 years ago is not really happening today. What is happening today is that there is enough technology available so that you can take an idea, get it funded, and get started.

And what is important in growing in an area—and Silicon Valley is a good example of this and now Boston is a good example—is that there are support systems all around it. I mean, I don't have to worry about—if I go out for manufacturing, I can go 5 miles down the road and I have a company that just does manufacturing. And then there are five companies that do printed circuit board layout, and there are other companies that I can get temporary people from.

Representative LUNGREN. So you have a total infrastructure here in your industry.

Mr. SEVERINO. Exactly. And that sort of spawns for this.

I think if you look at it in a new environment, first you have to build that structure, and typically that gets done with at least one company that has been there and there are people now that are spinning off.

Representative LUNGREN. But the real extraordinary thing about Route 128 and about Silicon Valley is, yes, you had the strong educational institutions and perhaps you had some large companies that developed, but there was something there that had a lot of entrepreneurial spirit—that caused an entrepreneurial spirit, yet you have people that are as technically talented, I would suggest, in areas that have very good educational support that didn't have that same spirit.

New England and California are two very different areas, yet both of them seem to be the sights of people who had this idea that they would go outside the womb of the large company, and we have talked about some national policies that can help that. If there is tax policy that makes you realize that the risk is so great that even if you succeed in a commercial sense the taxes are going to kill you, you are apt to stay with the big guy that you started with.

But there was something about the entrepreneurial spirit in both places, and perhaps, as someone suggested, there are role models. You see a couple of people do it. That encourages you. You see it can be done, and you can try it as well.

After a while a culture develops which suggests that it is not a black mark on your life if you fail because if you are going to have an entrepreneurial environment you have got to accept that a large number of people are going to fail, but that doesn't mean that they are failures. They may try again. If you don't have the ability to fail in a system, you are not going to have the entrepreneurial spirit because the risk isn't going to be there so that the rewards will be there. Mr. Foster.

Mr. **Foster**. I think you might be looking for something that really isn't there, though, in terms of a specific reason why it happened in these two areas.

Ken Olson—granted, Ken Olson lived here and went to MIT, and Bill Hewlett and Dave Packard went to Stanford and lived out there. But if Ken Olson had happened to be in Chicago, it is possible that his company would have started in Chicago, would have spawned a Data General in Chicago, which would have spun out a Stratus and would have spun out 20 other companies. It didn't happen there because he wasn't there, he was here. And maybe you can give the credit for that to MIT.

But you will see Austin, TX, develop, and it is a major startup area because they have all the ingredients. It has a number of very good high tech companies that are there today. They weren't there 8 years ago, but they are there today. So there is talent there. There is a good amount of venture capital available today.

And you will see it in Research Technical Park. You won't see it in Lake Tahoe because there aren't any high-tech companies. So there are no people to start a company with.

Representative **Lungren**. Too many things to do instead of going inside.

Mr. **Foster**. Too many things to do, yes.

That is one of the advantages, by the way, of starting down here in Boston. In the wintertime people spend more time indoors working. They don't get distracted by the ocean and things like that.

Representative **Lungren**. I wish one of your companies could at least maybe pool some resources to get some air-conditioning for where your Boston Celtics play, so next time when our California teams come out, they don't die on the vine.

Mr. **Foster**. We thought it was great. [Laughter.]

Representative **Lungren**. Mr. d'Arbeloff, you really went into the question of taxes, the way the tax treatment of stock options decreases the incentives that otherwise are available. I want to salute you for that because I have heard that every place I have been, and you are the first person involved in this industry that has told me that he understands it and has given me some ideas.

I was despairing of the fact that if it is so complicated that folks as talented and with an entrepreneurial spirit, as you can't understand it, then there is a reason why those of us in Congress can't understand it as well.

The problem we have in Washington is that—well, I will just confess to you, before I had this round of hearings I had not realized how important stock options were.

I would ask if all the panelists would agree that stock options are important for both startup companies and those who want to then maintain their folks.

Mr. **Severino**. Absolutely.

Representative **Lungren**. In Washington stock options have been viewed, at least when we discuss them on the floor with respect to changing policy, as sort of this thing that is available to the highest priced executives in our largest corporations, and it lets the wealthy get wealthier, and we have got to do something about it.

Very little attention, I must tell you, has ever been given, that I am aware of in discussing it in the Congress, to the aspect that it may play in startup companies or in helping the little guy in those companies.

One of the things I was struck by is the number of companies in Silicon Valley—and I assume here in 128—that make stock options available to the largest percentage of their employees.

And here we talk about stock options in the Congress as being something in the province of the wealthy on the one hand. On the other hand, we are constantly trying to figure out what way we can create—or ways we can create that allow employees to have a piece of the action, and stock options appear to be the way, and yet we don't bring those two together.

What do stock options mean—I would like the four of you to tell me—with respect to the motivation of your employees or the ability to attract employees?

First as a startup company, then we will go on to a developed company.

Mr. Bowman, first.

Mr. **Bowman**. The thing that startup companies typically don't have is a lot of extra cash, and when we started Spinnaker we had to hire, you know, a chorus of 14, which we did, and we brought those people in at about 75 percent of their current salary, and we maintained that ratio pretty much for a year.

Now, having that additional cash available to help grow the business was real critical to us during those first 9 or 12 months. Obviously, the only way we would be able to do that is to offer them something, and what we offered them were stock options.

They were so successful with that group of people that we have extended our option pool to every single employee, and every year in early June—this is the second—the third year now that we have done that—we have what is called Employee Appreciation Day, and we grant stock options to everyone who is on the payroll that day, based on how long they have been with the company.

Now, obviously, our vice president of marketing is going to get additional options, but having the secretaries and having the clerks and having, you know, the junior programmers who perhaps have even been with the company only a period of 30 days have a piece of the company is enormously important. The people on the production line own a piece of the company.

And what we see there is just a spirit that is very difficult to really define. What it has really done is it has erased barriers between management and all other levels of the company. There is a feeling that we are all pulling together. There is very, very little griping when you have to work late in the evening, as people have to do during the Christmas season—ours is a seasonal business—and the reason for that is people realize that they have a piece of the company, and it just creates a wonderful working environment, and it is a critical part to our whole ability to attract and retain very talented people.

Representative **Lungren**. Mr. d'Arbeloff.

Mr. **d'Arbeloff**. Well, I was just thinking, you know, you give options to everybody, and I think a similar program is available at Stratus, but you can see how—what the secretary is doing to—what is going to happen when she exercises her option and finds she is subject to the alternative minimum tax, and then try to explain what that is.

There was an article in the Globe that explained this problem, and it was half a newspaper page, and by the time your read it you were completely confused. And so are our people. And so you have some fairly junior people getting stock options getting a big fee.

One thing to remember, though, is that there is another plan called a stock purchase plan, which is effectively a 1-year option, that is available for everybody. And the one thing we have to do with options, whether we give—we have to make them disproportionate, in other words not even across the board, because we do have to reward the key people.

So my suggestion was that if the options are broad—and my definition of broad is 10 percent—and in smaller companies and start-up companies probably you will give it to everybody, but as the company gets bigger you institute stock purchase plans, which are very effective, and then you will give it to 10 percent.

For example, General Motors—I don't know how many employees they have—10 percent would be thousands of employees in stock options. They can't do that, or maybe they can. It would be nice to think that they might.

Representative LUNGREN. Some day they may be competitive again.

Mr. D'ARBELOFF. Right.

Now, at Teradyne we have something a little over 10 percent of our people. We have 4,500 people, and we probably have some 500 people on the stock options, and that is a large program.

I would suggest that if the program is large then there is a different view that should be taken in terms of public policy than if the program is small and exclusive.

Now, I am not sure that—I tried to make it simple by saying 10 percent and no more than one person getting 10 percent, but it may be that a little more study would make it a little more complex than that, but probably not much more complex.

And also this ability to get—you go to an employee, and you say, look, I will give you some of these shares, the stock will appreciate so much, maybe make some estimates of that, you will get 80 percent of that if you stick with us and make your project successful. No complications. That is a great thing to be able to do.

Representative LUNGREN. Mr. Severino.

Mr. SEVERINO. Yes; we have used stock option plans, a number of stock option plans. We have had—I guess they are called qualified stock options, and most recently we actually instituted an employee stock purchase plan.

At Interlan almost every employee has stock in the company.

The biggest problems, as I see it, are the sequencing issues on the unqualified plans because when someone comes in and you give them *x* amount of shares, 6 months later he might—he or she might turn out to be one of the best contributors in the company and you want to give him more shares. The sequencing thing makes it very difficult to do that, that is a problem.

The other thing is the alternate minimum tax, especially at the higher levels, is a complicated issue for a lot of people. It is better than it was. A few years back when I was at Prime Computer, I remember unqualified stock options. The day you purchased the option, even though you didn't sell the shares, you owed taxes, which is a real problem for a lot of people. And then you have to sell some shares off just to pay the taxes on the option you purchased.

So that has been changed, and it is better. But, you know, our policy is that equity in participation by every employee is important, and that is what really allows people to grow, both professionally and economically.

In my own experience—and I have worked with Digital Equipment Corp., I had stock options. I was one of the original engineering staff at Prime Computer, and those stock options became worth a significant amount of money.

And I feel that it is the best way to motivate people to do what has to be done. In most cases it is 60-, 70-hour weeks for a lot of the technical people, for the staff people, for the marketing people, and for the manufacturing people in some cases, and it just takes an awful lot to compete in the market and keep the people that do that—the ones that work a lot of hours.

So the reason they do it is because they know that at the end of the quarter they made the goal and they see an appreciation of their shares. So it is very important.

Representative LUNGREN. Mr. Foster.

Mr. FOSTER. The reason that, I think, that stock options are important is that these people focus on the right areas. You spend the company's money as if it was your own. And if you are a stockholder, or a stock options holder, you know your stock option is worthless unless the company makes money.

The biggest problem I see today now that we are a public company is this $100,000 limit. We are looking for a vice president of International Marketing. It is a position we have been looking for for a year. It is a very important job for us because international sales should be 50 percent of our business down the road. Today it is 15 percent or so.

If we try to attract someone from a big company—IBM or Hewlett-Packard—they still look at Stratus as a tiny company. You know, we are still considered a startup in many respects. However, since we are a public company I am limited. I can only give a guy 10,000 shares because our stock is selling for roughly $10 a share right now. So he would get an option for 10,000 shares. However, if he were to join a private startup that is maybe only 2 years old, he might get several hundred thousand shares. So I can't compete for that same level of talent with that nonpublic company because of this $10,000 limit.

So that is one of—what I view as the biggest restrictive problem with the option plan.

Representative LUNGREN. Now, the four of you on the panel are all entrepreneurs. You have all taken ideas and made them work in a commercial sense, and of course that is one of the real attractions. You have taken it from the idea stage to a stage that is practical that people can use and it therefore adds to the commercial wealth of the country.

What barriers do you see right now with respect to the movement of ideas from Government and university labs, and are there things we can do to remove those barriers?

Any of you care to take a crack at that?

Mr. SEVERINO. We are sort of an omniscient customer to a lot of the Government labs in Los Alamos, Lawrence, Livermore, and all those kind of places. I felt that the exchange of information in the public domain kinds of software and things like that was very good. It was available to those who wanted to use it. There was no restrictions, and a lot of software and a lot of the techniques had been developed, as I said, by the Department of Defense.

Also, when I was at Prime Computer, one of the founders of Prime came from the Department of Transportation Act environment where he was able to bring some software from there.

So I felt that, you know, as public domain software and developments that were—that are available and very easy to get. And one of the reasons it is easy to get that was because of the university environment.

Representative LUNGREN. Anybody else have anything?

Mr. D'ARBELOFF. I don't have much experience because we do very little Government work, but in general, in terms of universities, there is pretty free access back and forth.

Representative LUNGREN. So we have had some legislation over the last number of years which requires the Government labs to do a better job of trying to get information out that may be applicable in the private sector, and we are trying to find out how successful that has been.

One of the discouraging things is that they have set up a center for giving that information out and making it available to everybody. It is called the National Technical Information Service, and we have discovered that the Soviet Union used to be the No. 1 user for that information, and the second greatest user of that information is a little tiny company you may have heard of called Mitsubishi. [Laughter.]

And that suggests either we are not doing a good enough job of letting people know that that is available or the information that is available somehow is better read in Russian or Japanese. I am not sure which.

But I take it the four of you haven't had a whole lot of experience one way or the other with it.

Mr. FOSTER. I think, again, in my industry, the computer systems industry, I wouldn't think that information is generally that important because in our business most of the real innovation comes out of industry, not universities and not Government. So you probably could do just as well to restrict access so the Russians don't get it.

Mr. BOWMAN. I really agree with that. If they are the No. 1 customer, I would close it down. I tried to use NTIS when I was a Government employee, and it was virtually impossible, just too difficult, and when we get stuff out of NTIS it was in an abstracted form that wasn't generally useful enough, and it just took too long and it was too difficult to get the original documents.

And I really agree that in the information that is shared by Governments and universities in the major university centers, there are plenty of avenues of communication that way.

Representative **Lungren**. Let me ask you this: Are the research parks—in some areas they have incubator facilities—do you think they are effective mechanisms for assisting startup companies, or is there much experience with that in this area?

Mr. **Foster**. I am not sure what you mean by that.

Representative **Lungren**. Well, that's what some companies or some areas have done, and that's where they have a whole building, if it were available, for relatively subsidized costs for small companies to come in there and, at times, they will then try to make available to them different—sort of create their own networks. If they need some assistance in management, there might be someone to give them some assistance in that, and so forth.

Mr. **d'Arbeloff**. Well, I just was thinking that entrepreneurs, psychologically, want to get away from the mother company, and as a result, for me personally, I would stay away from a thing like that, just on principle, even though it might be helpful.

Representative **Lungren**. I must tell you, 2 weeks ago the suggestion was made that this would be a great idea for certain States to catch up. They'll create an incubator facility and attract all these people, and sometimes I wonder if we think we can plan those things that happened, because individuals decided to get together themselves.

Mr. **Foster**. I think Control Data tried that tack. President Norris, I believe was his name, at CDC, had that idea. I don't think it's been that effective. In the first place, the cost of the facilities is peanuts compared to where you really spend you money, when you start a high-tech company. It's the cost of the engineers and the equipment and all that. So they're not helping much by providing free rent. And what Al says is exactly right. The reason I started a company was I wanted to be on my own. I wanted to be the president of a computer company. The two companies I worked for, they weren't about to make me president, so [laughter]——

Mr. **Bowman**. Same here.

Mr. **Foster** [continuing]. I had to start on my own and working inside a bigger one would be just the opposite of what I wanted to do.

Mr. **Severino**. One of the things that I have seen, though, is I went to Rensselaer in New York State, and they have a program by which they will allow some graduate students—or even people in the community to get some space there to do some work. And there had been a company that had spun off out of that, Orasta Technologies, but they actually moved to Boston. They're located in Boston now. And they also have started a sort of technology part to try and encourage the growth, you know, out of the university into the commercial environment.

I think it's going to take a long time. It's just not a very popular place, and I didn't want to live there, and I left.

Representative **Lungren**. Do any of you think that you can teach the skills of entrepreneurship? Is there a way to transfer them through—as we used to call it, "book learning?" If so, are the universities with which you are familiar doing the job to try and suggest that approach, as opposed to the approach of joining the biggest companies and staying there for the rest of your life. Yes, sir.

Mr. D'ARBELOFF. Well, I'm familiar with work being done at the Harvard Business School right now which is very interesting. The basic premise is that almost every course at the Harvard Business School teaches you how to organize something better than what it was before. And yet we all know that new ideas flourish in chaos and confusion, rather than in an orderly process.

Representative LUNGREN. That's an awfully nice compliment to Congress. I appreciate it. [Laughter.]

Mr. D'ARBELOFF. So I think they're beginning to rethink some of the basic ideas about organization and about how things ought to be run. And there are some young professors that are now trying to do some fundamental work on that. And I would say that it's promising. I mean, it's going to be a few years. But I think that that's the way it's going to start, with people beginning to think about this. They had a meeting on entrepreneurship and people came from all over the country, I mean, schools all over the country. And now people are very interested in that. I would think it would start in the schools, but also I think it's happening within companies. I know in our company we talk about entrepreneurship—startup is also entrepreneurship within companies, and you can make—I think you said it very well, you got to be able to make it easy to fail and try something new within the organization. And I think that is the way to teach people.

Representative LUNGREN. That leads me to another question. Your company is a little larger in size than the others here represented. How do you try and maintain the entrepreneurial spirit? How do you make sure yours doesn't become a dinosaur in the industry and lose more by the good talent going out to start up their own companies than retaining some of that?

Mr. D'ARBELOFF. Well, we have had one spinoff. But, in general, the things that we have learned that if you want to start a new thing, it's small, fragile and unimportant, and what you got to do is to permit that to exist separately in some ways. That's what we did with a venture in Chicago, and that's turned out to be very successful. We also started a venture in New Hampshire which has also turned out successful. We're starting a couple of ventures now. But generally, we're willing to make it separate. We're willing to get them to change policies. We're willing to do those kinds of things. I think IBM showed that in the Personal Computer. Although they were second, they permitted a group of people to totally violate IBM policy, in order to start the Personal Computer Program. And it's very interesting that that's what made it successful.

Representative LUNGREN. In Congress at the present time, as a matter of fact when we go back next week, we'll start the confrence between the House and Senate on the question. We are dealing with a joint R&D antitrust exemption bill. Does that affect you folks in any way? Right now, maybe we hear from some of the larger companies on this, there's a major concern in competing with Japanese interests. Specifically, if two companies get involved in joint R&D the antitrust laws are so confusing that even though the Attorney General under two administrations has put out two booklets about this thick, explaining how you can stay out of antitrust trouble. If you read the preface to it, it says despite anything in here, this does not mean that we can't go after you even if you follow it, which has a tendency to diminish the incentive for being involved in joint R&D programs.

Does that in any way impact on your businesses or can you conceive of it impacting on it in the near future?

Mr. D'ARBELOFF. Well, I would say competing with the Japanese who have much more cooperation than we do, it could. But in general, somehow companies have to be successful on their own, fundamentally, but sometimes some cooperation could be helpful, and right not it's impossible. It's hard for me to say—I can't think of a specific right now—you know, where we'd like to get together with our competitors and do something together, but probably some exemption and some loosening of that might be helpful.

Representative LUNGREN. Does it impact you?

Mr. FOSTER. OK. Al is in a little different state, because his company's much larger than ours, but—IBM has gotten pretty aggressive lately, but I doubt that they would throw an antitrust against Stratus, if we decided to join forces with somebody else. It's just not going to happen. I never even think about it.

You know, concerning your earlier question on whether universities can breed entrepreneurs. One of the reasons I decided to do this was, I got to know a bunch of successful entrepreneurs. And what I discovered is that they weren't any smarter than anybody else. They weren't any better than anybody else. Sometimes they thought they were, because they really were a smaller network, or whatever, but they're the same. The only thing that was different was they were willing to try something where they might fail. And I don't think you teach that. I mean that's a characteristic some people have. They're willing to go out and try something and accept failure if it doesn't work out, while other people are looking for a lot more security. And I think that's why, even in a big company, it's possible to create an environment that's somewhat entrepreneurial, and you're going to keep the majority of the people happy and creative and all the rest. But there's always a few that are going to spin out, because they're not going to be happy with being inside a big company. You just have to expect that that will happen.

Representative LUNGREN. It is interesting, someone in Silicon Valley put it similarly. He said, "I looked at someone and said, 'My God, if he can do it, I certainly can do it.'" And that was sort of the way he was encouraged.

As you know, we're discussing in this Presidential election year and both parties are talking about it, and I think we'll probably do something about tax simplification, and move toward a flat tax rate. I doubt we'll move to a total flat tax rate, but I do think we probably will move somewhat in that direction with the lowering of the top tax rates and a broadening of the base and a narrowing of the number of brackets that we have.

Would that sort of movement affect some of the inventives you've indicated that are helpful, in terms of starting up a company? Would that sort of a tax which would narrow the difference in treatment of regular income and capital gains be detrimental?

I'm not going around looking for a cloud with every silver lining, but it just strikes me we talk about the flat-tax rate and everybody's in favor of it, until they talk about the particular tax incentive that they happen to be using at that time.

Mr. SEVERINO. Well, a flat-tax rate on income I don't think will have a detrimental effect on starting companies, but changing the rate on capital gains, long-term capital gains, would definitely have an effect. Venture capitalists and employees and people that start companies really make their profit from their capital gains. And if you'd start to increase the capital gains tax, then there are other places where you can invest it and put money and take a lot less risk and get returns which might be quite similar.

So I think the flat tax on income is not a major issue, but changing the capital gains tax rate would be.

Representative LUNGREN. So as far as you're concerned, it's important that you have a differential between the capital gains rate and whatever the income tax rate might be?

Mr. SEVERINO. Yes; I think that the rate as it is today is very workable and everyone thinks it's pretty fair and reasonable to take a risk, but if it starts to get up higher than that, then it becomes a problem.

Mr. D'ARBELOFF. Well, I would say that if the tax obligation made all income taxes 20 percent of the law, then we've accepted the 20-percent capital gains tax. Actually, I think if it were zero, it would be better, but if we've accepted the fact that 20 percent is workable, then it's workable. But it seems to me that's not the way the proposals are going to work out. It will still be some incremental thing for higher income, and then you get back into having needed that capital gains tax to stay at 20 percent, and then needing to have things like options be able to be exercised with capital gains treatment instead of the other.

Representative LUNGREN. Yes

Mr. FOSTER. You have to have lower capital gains tax, to venture capital, Bill, and I think the lower the better. I think zero would be better than 20 percent. I think, in terms of how tax policy would create other 128 areas or Silicon Valley areas, that's more of a State tax issue rather than Federal. Companies expanded out of California and out of Massachusetts into Texas and into North Carolina because of lower taxes in those States. They put plants up there, so that people can live there with a lower tax rate. That's what helped Austin, TX, get started. Now that Austin is started with companies like Data General, plants down there—and Intel—and the others I mentioned, they're going to see some spinoffs. But those parts of the United States that are interested in developing areas like this, they only have to look at their own tax policies, and they better be attractive for big companies to want to expand into those areas.

Representative LUNGREN. And you made a statement earlier that caught my attention, which was, our company would not have been started without the capital gains tax decrease.

Mr. FOSTER. Right. I was lucky, because I had really no knowledge of the venture capital climate. I decided I wanted to quit and start a company in 1979. If I had tried it 2 years earlier, I probably wouldn't have gotten off the ground, because 2 years earlier venture capital was very scarce, because that was prior to the——

Representative LUNGREN. So that's an important message, because as we're talking about tax simplification and everything else, you've heard some comment in the press by some that we've got to do something about the way taxes are affecting the rich, that it's too easy on the rich, and so forth. Unfortunately, that oftentimes gets translated into: Look how capital gains taxes are treating income differently than earned income; therefore, we better go against it. And that's great rhetorically, but the problem is, with evidence such as yours, that your company never would have started, had we kept the capital gains tax up where it is.

Mr. FOSTER. There was probably better evidence than that. What is the annual collection of capital gains tax?

Representative LUNGREN. Oh, it's absolutely right. That evidence is in. There's no doubt about it. We collect more under capital gains tax after they dropped them than we did before. In fact, if you look at the most recent across-the-board tax cuts we had, the Treasury Department anticipated a loss from the highest taxpayers in the first year and increases thereafter. In fact, instead of a $7 billion or $8 billion loss in the top categories, they got a $7 billion gain, which is a difference of about $14 billion or $15 billion in what they anticipated. So it is proof that in certain cases, if you drop rates, in fact, you will increase revenues to Government. There's no doubt about that. The problem is, we forget about examples such as yours, where companies were created, jobs were created, as a specific outcome of us reducing those rates, because, it shouldn't surprise us, people react to incentives and disincentives differently. Sometimes we want to believe that they don't.

If there was one single thing that you could say to Congress with respect to what public policy should or should not be, in terms of maintaining and fostering an entrepreneurial climate, what would that be? Mr. Foster.

Mr. FOSTER. Just one?

Representative LUNGREN. One or two. All right, you know.

Mr. FOSTER. We touched on low capital gains tax, that is just one, and the other would be the stock option policies, improve those.

Representative LUNGREN. Mr. Severino.

Mr. SEVERINO. Yes. I'd just add that, you know, I think that those kinds of policies—helping us, that those kinds of policies are very good, but getting more involved at all in any element would be a mistake. I think the free enterprise system and the entrepreneurs and the presidents of larger companies like Teradyne really need that freedom to go off and build their companies. They know what they're doing.

Representative LUNGREN. Mr. d'Arbeloff.

Mr. D'ARBELOFF. Well, I agree. Capital gains and stock options.

Mr. BOWMAN. The same two.

Representative LUNGREN. Then one last question. That is, is there a capital gap? We were talking about venture capital, and, in California, they told us that there's more Venture capital available in Silicon Valley than there are startups or possible startups, and they're beginning to look other places. But there are those that suggest that there is a capital gap with respect to companies even in the high-tech area that may be making incremental advances in high tech, but not the promise of the great return or the great leap forward, technologically, and therefore, financially. And that those companies and those entrepreneurs who do have a contribution to make, get left behind.

Do you have any thoughts on that?

Mr. D'ARBELOFF. I do. I think a lot of those companies that are having trouble raising financing probably shouldn't be raising financing, because they're not going to be long-term survivors. There is a real need for shakeouts in industries. Our industry is going through one right now. That's a very healthy thing. And I think the capital markets are extraordinarily efficient. They don't tend to like to fund companies that aren't going to be long-term players in certain industries. I think that's happening today. I think also that due to the unavailability of the public market to many companies today, a lot of other companies are feeling the pinch. And pension funds, even though they're larger, perhaps, in total dollars—maybe not—some venture capital companies can't make up that difference right now.

Representative LUNGREN. Mr. d'Arbeloff.

Mr. D'ARBELOFF. Well, I might question the venture capitalist's judgment, but you know, there's 150 floppy disc drive companies, and we just don't need 150 companies in that one field. So there'll be a shakeout. So you might argue that they've gone after the thing that was popular instead of maybe somebody having a less popular, more oddball idea. So I think you might question their judgment, but certainly, you can say there's money.

Representative LUNGREN. Mr. Severino.

Mr. SEVERINO. Yes, I think that the decisions for investment are made based on term, and whether you're in a business which is considered state of the art, or you're not, if it returns the right amount to the investor, you're going to get investment. And it turned out that venture capitalists sought to make 10 times their money in 3, 4, or 5 years. And you do that in high-tech environments, because the growth is significant and the earnings, the price-earnings ratio that the public is willing to pay for its shares, is higher in other areas. However, there are other means to finance companies that don't—the Small Business Administration. So I think that the venture capitalists ought to finance certain types of companies and there are other ways to finance other types of companies.

Mr. FOSTER. I think it could be a little misleading to say that venture capitalists make 10 times on their investment, because if they do, they do it rarely today, and I'm sure you'll agree with me, they've got a lot of problems out there. And they expected that, because for every successful company, there's a lot larger number of unsuccessful companies. It's certainly true when you start a company you're perfect, and all you do from that point on is make mistakes and go downhill. So in some respects, it's easier to raise money before you've done anything, than if you've been out there for a few years and you've had a history which isn't quite as good as someone might have wanted it to be. And it is difficult for a company that's doing $10 million this year and $12 million next year or so, to raise a lot of venture capital.

And that might be an area where Government can be involved. For example, here in Massachusetts, there is a fund that was set up by the State, supplied by revenues from insurance companies. I think it was called mass capital resource fund. There's lot of money there. In theory, that goes to the companies that you described, ones that are already in existence that have slow growth, but they have a need for capital. I don't think that that's going to be of interest to the area—for venture capital, because they can't see the chance for big gains.

Representative LUNGREN. Well, I want to thank the four of you for taking your time, being so generous with it. I certainly appreciate it. This is an interesting analysis for me and for the committee to make a comparison between Silicon Valley and Route 128 and see what similarities and dissimilarities there are and what guidance that may have for public policy.

So I thank you for being with us this morning.

I would ask to come forward Mr. Dan Holland. Mr. Arthur Little, Mr. Jack Neises.

I want to thank you for for sharing your time with us this morning.

OPENING STATEMENT OF REPRESENTATIVE LUNGREN, PRESIDING (PANEL 2)

Representative LUNGREN. Without a vibrant venture capital community, it's obvious that the Boston region could not be what it is today. Launching new companies and financing their development requires enormous sums of money and the risks are high. The gains from successful deals can be spectacular, but as we have heard, many venture capital deals will fall by the wayside.

The Joint Economic Committee is particularly interested in knowing more about the availability of risk capital in Boston's Route 128 corridor and its contribution to the region's overall climate for entrepreneurship and innovation.

The rapid growth of venture capital funds since 1978 has been documented in a number of studies. These studies have also confirmed that the availability of risk capital is quite sensitive to Government policies, such as taxes and regulations. The committee would like to know more about how tax policies and regulations affect risk taking and innovation.

Also, the relationship between Boston's entrepreneurial and its venture capital community is of interest to our committee. How are deals discovered and made and what can the Government do to assist the venture capital process or what can it do to make sure that it doesn't get in the way of the venture capital process? What are the most significant barriers to business development financing and what can be done at the Federal, State, and local levels to remove these barriers?

We are fortunate to have before us a panel of experienced venture capitalists from the Boston region to help us find answers to many of these questions.

Again, I want to thank you for coming. We welcome your appearance before the committee this morning, and we look forward to hearing about the Route 128 phenomenon, as we heard about the Silicon Valley phenomenon earlier this week from the perspective of the venture capital community.

Maybe I could just go from my left to right and ask Mr. Jack Neises—I hope that's the right pronounciation——

Mr. NEISES. Right.

Representative LUNGREN [continuing]. General partner of Charles River Partnerships, to begin. And if we perhaps might confine the opening remarks to 10 to 15 minutes, we could then get into the question and answer period.

PANEL 2. VENTURE CAPITAL FINANCING: A ROUTE 128 PERSPECTIVE

STATEMENT OF JOHN T. NEISES, GENERAL PARTNER, CHARLES RIVER PARTNERSHIPS, BOSTON, MA

Mr. NEISES. Thank you for the higher mike.

I'm John T. or Jack Neises, one of four general partners of the Charles River Partnerships. We're a venture capital firm located in Boston, and in our 14 years of existence, we have made over $80 million of investments in about 105 companies. Seven million dollars of that $80 million was obtained from the Federal Government under an SBIC license, which we have subsequently turned in.

Before joining Charles River 14 years ago, I was general manager at Dennison Manufacturing here in Framingham and ran their copier division. Before that, I was at Xerox and had a number of managerial jobs, primarily in the marketing and controllership area.

Our capital comes from large university endowments, pension funds, wealthy individuals, a whole host of people that are seeking long-term capital gains.

I think I'll close at that and let my colleagues make a short introduction.

[The prepared statement of Mr. Neises follows:]

PREPARED STATEMENT OF JOHN T. NEISES

I am John T. Neises, one of four General Partners of The Charles River Partnerships, a large venture capital firm based in Boston. I was one of the founders of Charles River Partnerships and in 14 years, we have made over $80 million of investments in 105 companies. I am now on the Board of Directors of six high-technology firms spread throughout the United States. For five years I was on the Board of Directors of the National Venture Capital Association. I am a member of a Visiting Committee on Entrepreneurial Studies at Cornell University. I am a member and ex-President of Norumbega Council, Boy Scouts of America and hold a Silver Beaver award. I have held numerous alumni posts at Harvard Business School and am a member of the Parents Council at Rhode Island School of Design.

Before joining Charles River as a Venture Capitalist, I was General Manager for Dennison's Copier Division, and had been in various managerial positions, including Sales Manager, Director of Marketing, Division Controller, and Head of Planning with Xerox Corporation. I graduated from the University of Cincinnati in 1952, served in Korea as a 1st Lieutenant with the U.S.A.F. until 1954 and earned an MBA from Harvard in 1956.

I have been married for 33 years, and we have raised three children. One is in college, the other two have finished college; one is in the U.S. Marine Corps and the other is working in Dallas.

Charles River has just finished raising its fifth fund of over $70 million. Our first four funds were approximately $[illegible] million, $14 million, $25 million and $39 million, respectively, and have earned an above-average return for our investors. We still supervise active investments in all but our first fund.

Investors as Limited Partners in Charles River's funds range from pension funds, such as Brunswick, General Motor, and Timken, to technology developers like the Cabot Corp., SmithKline Beckman, and Mayfield Venture Fund. Manufacturers

Hanover, John Hancock and other institutions invest in Charles River, as do universities such as Boston University, Carnegie Mellon University, Cornell and Stanford.

Charles River's portfolio includes high-technology companies and some health-care investments. Earlier, some 30% of our portfolio companies were computer hardware firms, while 20% designed software and integrated computer systems. Now there is a much stronger concentration on telecommunications, integrated systems, and more software companies. Health care has also recently become a significant portion of our investment portfolio.

In the area of high-tech, we see trends toward integrated computer systems instead of software-only or hardware-only companies. Telecommunications is growing and will continue to occupy a large portion of Charles River's portfolio. We also see an increase in our participation in start-up and early stage ventures. We are also changing our focus from California investments to more New England companies, now fully one-half of our portfolio.

The Charles River Partnerships have been successful in a number of diverse companies. We have participated in the growth of Applicon, a New England manufacturer of computer aided design equipment. Dysan, a very successful Charles River investment, is a world leader in computer magnetic disks and other related products. Polymer Technology, a recent investment, makes the well-known "Boston Lens" for soft lens wearers. And another successful investment, VIA Systems, is a tough competitor in the world of integrated circuit "chip" design systems. Advanced Robotics does arc welding by robot. Amgen and Cytogen are genetic investments aimed at controlling human diseases and improving health.

With our expertise, time and money, Charles River contributes to the growth of new companies, new technologies and the development of both jobs and regional economies. These excellent private sector jobs also provide city, county and federal governments with needed tax revenues. Quality venture capital investment adds the benefit of many years of business experience to innovators building their young companies, helping them to grow responsibly and profitably. We also feel these companies are doing much to increase American productivity as well as improving health and the quality of life in this country.

Representative LUNGREN. Next, Mr. Arthur Little of Narragansett—is that the right pronunciation?

Mr. LITTLE. That's close enough.

Representative LUNGREN. All right. Narragansett Capital Corp. in Providence.

STATEMENT OF ARTHUR D. LITTLE, CHAIRMAN AND CHIEF EXECUTIVE OFFICER, NARRAGANSETT CAPITAL CORP., PROVIDENCE, RI

Mr. LITTLE. I'm Arthur D. Little, chairman of the board and chief executive officer of Narragansett Capital Corp.

We are an oddity in the venture capital business in that we are publicly owned. We have total assets of about $111 million. Our original capital came from a $5.5 million public offering back in 1960. To make ourselves somewhat further strange in terms of organization, in 1982, we raised $75 million in a limited partnership, which we call Narragansett First Fund, from pension funds, insurance companies, university endowments, and wealthy families. Thus we became the first publicly owned venture capital company to also be the general partner of a private fund.

To date, we have invested approximately $150 million in 150 portfolio companies. Our investments are located throughout the continental United States with an emphasis on the northeast quadrant of that geographical area. Our financing has ranged from start-ups to leverage buyouts. As a result, our portfolio companies are tremendously varied in the industries which they serve. I currently serve on the boards of eight of our portfolio companies and have probably served on the boards of about 30 over a 17-year period of time.

I entered the venture capital business in April 1967 after I was graduated from Stanford University with a B.A. in history. I am currently a director of the National Venture Capital Association. In 1980, I was the president of the National Association of Small Business Investment Companies, and I served for 8 years on the board of governors of that particular group.

I also happen to have a strange, but somewhat interesting further qualification, in that I happen to be married to another venture capitalist, whose name is Janice Leeming, who works for the Venture Fund of England. So with me, you kind of get a two. [Laughter.]

[The prepared statement of Mr. Little follows:]

PREPARED STATEMENT OF ARTHUR D. LITTLE

I am Arthur D. Little, the Chairman of the Board and Chief Executive Officer of Narragansett Capital Corporation—a publicly-owned venture capital company—with total assets of approximately $111,000,000. Narragansett received its initial capital of $5,500,000 in public offering in September of 1960. In 1982, Narragansett raised $75,000,000 in a limited partnership (Narragansett First Fund) from pension funds, insurance companies, endowment funds and wealthy families. We thus became the first publicly-owned venture capital company to be the general partner of a limited partnership. To date we have invested approximately $150,000,000 in 150 portfolio companies. Our investments have been located throughout the Continental United States with an emphasis on the northeast quadrant of that geographical area. Our financing has ranged from start-ups to leveraged buyouts. As a result, our portfolio companies are tremendously varied in the industries which they serve. I currently serve on the boards of eight portfolio companies.

I entered the venture capital business in April 1967 after I was graduated from Stanford University with a BA degree in History. I am currently a director of the National Venture Capital Association. In 1980 I was president of the National Association of Small Business Investment Companies and served for eight years on the board of governors of that group.

Representative LUNGREN. Next we have Mr. Dan Holland, general partner of Morgan Holland Management Corp. of Boston.

STATEMENT OF DANIEL J. HOLLAND, GENERAL PARTNER, MORGAN HOLLAND MANAGEMENT CORP., BOSTON, MA

Mr. HOLLAND. I am Dan Holland, and I appreciate being here.

You have, I guess, the writeup of our background, so let me just summarize it quickly. I have an engineering degree from MIT and a Harvard Business School degree. I spent a few years as an engineer and a few years working in research work at MIT, but the last 20 years primarily involved in financial activity related to high-technology companies, including commercial lending activities, both in Chicago and in Boston, but first in Chicago. I began work in the venture capital business in 1969 with American Research & Development, the company that had been responsible for starting Digital Equipment Co. 12 years earlier.

I also had the opportunity to start Massachusetts Capital Resource Fund referred to earlier as be[illegible] $100 million fund located here in Massachusetts.

Two years ago, Jim Morgan and I, along with three other partners, started the Morgan, Holland Private Venture Capital Fund, a $58.5 million fund with the same type of investors that have been alluded to here before. We've only been in business 2 years, so we have approximately 12 investments. And I'm director of three of the companies we have investments in.

So in summary, I've been associated with the oldest capital firm in the business, ARD, and one of the newest.

Thank you.

[The prepared statement of Mr. Holland, together with the testimony of the National Venture Capital Association, presented by Mr. Holland, Mr. Little, and Mr. Neises, follows:]

Prepared Statement of Daniel J. Holland

I am Daniel J. Holland, managing general partner and a co-founder of Morgan, Holland Ventures, a private venture capital partnership founded in September of 1982. Morgan, Holland Ventures has $58.5 million committed from twenty-five investors including pension funds, insurance companies, individuals and industrial companies. Thus far, our investors total approximately $11 million in twelve different companies, primarily young and early-stage companies in the eastern United States. Those companies are engaged in computer-aided design, automatic test equipment, software and microcomputers, image processing, voice recognition, as well as other computer-related activities. I serve as director of three of these privately-held companies.

I have a B.S. in Mechanical Engineering from MIT and an M.B.A. from Harvard. Before entering the financial community I spent two years as an engineer in the aerospace industry and three years working as an industrial liaison officer at MIT—responsible for communicating results of MIT's basic research to the industrial community.

In 1965, I began training as a financial officer at the First National Bank of Chicago and four years later in 1969 I joined American Research and Development (ARD) in Boston, Massachusetts. ARD had been founded in 1946 and in 1969 had investments in 50 different companies with a net asset value of $555 million based upon a paid-in capital of $19 million. Although ARD operated very successfully from 1946 to 1972, it was acquired by the Textron Corporation of Providence, Rhode Island in May of 1972 and has continued as a division of Textron since that time. During my tenure at ARD I served as director of six of the ARD portfolio companies. I left ARD in 1974 to rejoin the First National Bank of Chicago and opened a new office in Boston devoted primarily to developing financial business with the high technology companies in the New England area.

In 1978 I was selected by the insurance companies headquartered in Massachusetts to start a $100 million fund which was to operate in the financial spectrum somewhere between venture capital activities and the long-term lending activities of the insurance companies. The fund, called the Massachusetts Capital Research Corporation (MCRC), was restricted to investing exclusively within Massachusetts and resulted from an agreement between the Commonwealth and the insurance industry in which the fund was established in return for certain tax concessions by the Commonwealth to the industry. From start-up in January of 1978 until I left in January 1982, the fund invested approximately $65 million of the $100 million in seventy different companies in Massachusetts. MCRC provided economic incentives to companies in Massachusetts and, in addition, provided a very acceptable return to the insurance company investors, in spite of the restrictions and complications surrounding the quasi-public nature of MCRC.

In summary, I have spent over twenty years in technology-based financial activities including commercial lending (First Chicago) quasi-government/private funding (MCRC), and intense involvement in one of the oldest (ARD) as well as one of the newest venture capital firms (Morgan Holland). In my associations at ARD, MCRC, and now Morgan Holland, I have been associated with investment in close to 150 different companies and have served on the board of directors of nine of these companies.

Testimony of the National Venture Capital Association, Presented by Dan Holland, Morgan Holland Management Corp.; Arthur D. Little, Narragansett Capital Corp.; and John Neises, Charles River Partnership

The National Ven[illegible]pital Association has 176 member companies and was formed to create a [illegible]er understanding of the importance of venture capital to the United States e[illegible]y.

It also works to stimulate the free flow of capital to young companies.

I wish to submit a prepared statement on behalf of the Association that explains venture capital, its vital role in the economy, and the impact certain tax policies have on the availability of capital to entrepreneurial companies and the ability of those companies to attract the talent needed to manage dynamic growth.

In the short period I have to testify I will attempt to summarize the more lengthy prepared statement.

Venture capital is the business of developing businesses.

The key to this process is the entrepreneur, or business person who starts his or her own company. Venture capital assists the entrepreneur with the money and expertise to make that company a success.

Most venture capital money comes from venture capital firms. These generally are private partnerships or closely held corporations funded by venture capitalists themselves, insurance companies, endowment funds, pension funds, bank trust departments, corporations, wealthy individuals and foreign investors.

Professional venture capital organizations invested $2.8 billion in 1983 to launch new businesses and finance growth of young companies.

But more importantly, these companies:

Create an unusually large number of new jobs and employment opportunities;

Improve living standards through accelerated applications of new technology;

Improve the productivity of all industry;

Create pressure on established companies to innovate and be price competitive; and

Generate significant new tax revenues.

These five activities have a vital bearing on the overall American economy and cannot be overemphasized.

Let me elaborate.

A study by the General Accounting Office in 1982 looked at 72 companies that had been founded with venture capital funds during the 1970's.

Despite the fact that only $209 million was invested to start the firms, the study found that by the end of the decade: "Their combined sales in 1979 alone totaled $6 billion. Growth in annual sales averaged 33 percent a year and, in the process, these firms created an estimated 130,000 jobs, over $100 million in employee tax revenues and $900 million in export sales."

Contrasted with this growth and productivity, it should be noted, between 1977 and 1982, Forture 1,000 companies lost 1.5 million jobs.

Another study by the American Electronics Association also shows the vital contribution venture capital plays in our economy.

The study examined 77 companies that had been founded with venture capital between 1971 and 1975. It found that in 1976, for every $100 in equity capital that had been invested, there were $70 in export sales, $33 spent on research and development, $15 in corporate income taxes, $5 in state and local taxes and $15 in personal income taxes from jobs created by the investment.

Venture capital is long-term investment with active involvement to build major businesses in order to realize capital appreciation.

While stock market investments are evaluated monthly, quarterly or yearly and emphasize short-term gain, the typical time frame from venture capital company start-up until the venture capitalist sells his investment is seven to 10 years.

Generally venture capitalists sell their investment through an initial public stock offering, or IPO, by the company or through the company's merger with or acquisition by another company.

Until this happens, however, the venture capitalist has an extremely illiquid investment and one that will remain so for a long time.

Federal tax and fiscal policy have an incredibly dramatic effect on the venture capital industry, which is why I'm here today.

We believe there are two issues that critically affect whether venture capital can continue to play its vital role in the American economy creating jobs, increasing productivity and maintaining this country's technological leadership. We would like to place those two issues before you and urge your support of them.

The first of these issues is capital gains.

The difference between the tax rates on capital gains and personal service income directly affects the growing availability of funds to the venture capital industry for investment in new, emerging companies.

Let me briefly look at the history.

Beginning in 1969, Congress gradually increased the long-term capital gain tax rate so that by 1977, the maximum rate stood at just more than 49 percent. In addition, Congress had reduced the maximum tax on personal service income from 70 percent to 50 percent. Because both taxes were virtually identical, there was little incentive to risk investing in young and growing companies.

In 1978 that trend was reversed, however, as the capital gains rate was reduced to 28 percent. A further reduction to 20 percent was enacted in 1981.

The capital gains rate reductions of 1978 and 1981 and the subsequent increase in the difference between the tax on capital gains and the tax on personal service income dramatically encouraged investment funds for the development of new, small businesses.

It is this differential that provides the incentive to investors in venture capital firms to take risks and invest in new, emerging companies. It is this differential that makes it attractive for investors to take the risk of investing in the initial public offerings of these emerging companies and provide the larger amounts of capital needed in their dynamic growth phase rather than invest in more secure income oriented securities.

Misguided tax policy in the 1970's had two deleterious effects.

First, it made the after tax returns in high capital appreciation oriented risk investments the same as in low risk income oriented investments, thus seriously impacting the access to the initial public offering market for emerging companies and their valuations in the market. Second, it dried up the availability of funds to the venture capital industry and therefore to new and young private companies because the risk reward ratio was significantly less attractive and the high rates locked up investment capital in older more mature investments. The impact of taxing high risk capital gain oriented investments at the same rate as more secure investments reduces the demand for those investments and therefore the prices at every level in the process. This multiple impact of lower demand, lower prices, lower returns and high taxation of any gains devastated the industry in the 1970's.

In 1975, at the bottom, the total new private capital committed to venture capital firms was just $10 million and there were only 4 underwritings of firms with a net worth of $5 million or less and only $16 million was raised for those companies. Since it requires capital to grow, the price paid in foregone jobs, useful products, exports, and taxes paid was a very high penalty for tax policies that were set without consideration of their impact on this critical element of the economy.

In contrast, in 1978, the year after the first capital gains reduction, the capital committed to venture capital firms increased to $570 million and with the more favorable tax environment has continued to increase every year since to $4.1 billion in 1983. The public underwritings of small companies has also shown significant growth to over $3.6 billion in 1983.

The more enlightened tax policy has resulted in the most dynamic period in the history of the venture capital industry and the promise is a large payoff in jobs, taxes, beneficial products, exports, and innovative competition. However, this will only continue if tax policy continues favorable and in the view of the NVCA that means low capital gains rates and a differential rate to reward risk taking.

Legislative efforts in the capital gains area are critical to further increase risk-taking and thereby provide more dollars for start-up companies and young, high-growth, job-producing independent businesses.

Most important is that we maintain or increase the current differential that exist between the capital gains tax rate and that for personal service income.

Whether we maintain or increase this difference will determine whether we maintain a favorable investment climate and encourage the long-term, risk-taking investment that sustains young and growing companies.

I would now like to address the second issue of vital importance to the venture capital industry—incentive stock options (ISOs)—and ask your support.

Incentive stock options are critical to the venture capital industry. Such options have three beneficial effects. new and emerging companies unable to pay large salaries can attract talented people; companies are managed for the long term; employees have incentives to perform their jobs better and make their companies more productive.

Congress has long recognized the importance of allowing employees to own a piece of the company. It has enacted legislation permitting employee stock option plans (ESOPs), employee stock purchase plans, and qualified and restricted stock option programs.

The key requirement in developing new companies into major enterprises is the building of management teams. The opportunity to create an after tax net worth is the major attraction that will cause capable managers to leave secure positions to join fragile new emerging companies. The capital gains opportunity afforded by Incentive Stock Options has been a principle recruiting tool.

Unfortunately, there are three serious drawbacks with the current ISO legislation.

The first drawback is that the law included the spread between exercise price and fair market value as a tax preference item, which is used in calculating the alternative minimum tax.

This means that someone receiving options can be subject to 20 percent tax on a paper profit at the time of exercise.

And that means that a person can be subject to a double tax—the paper profit at time of exercise and the capital gains tax at time of sale.

In addition, he also is paying a 20 percent tax on what could turn out to be a capital loss.

He also has to pay the tax when he invests in the company, not when he realizes cash from the sale.

The second drawback is that an employee can be granted only options which have a fair market value of $100,000 or less in any one year.

This serves as a artificial and arbitrary cap on incentive.

Finally, options must be exercised in the sequential order in which they are granted.

This severely diminishes the value of the option, particularly if the exercise price of options granted earlier exceeds the current fair market value of the stock of ISOs granted later have a lower exercise price.

To help a broad-based work force realize the American Dream of owning a "piece of the action," businesses in all spectrums of growth and development—emerging, high-growth or more mature, stable companies—should be able to grant stock options that don't penalize the employee.

We therefore would recommend three actions.

The first is to amend Section 57(a) of the code to eliminate as a tax preference item the "spread" income that exists when an option is exercised.

The second is to amend Section 442A(a) of the Internal Revenue Code to remove the $100,000 annual ceiling on ISOs.

In conclusion, we at the National Venture Capital Association believe that action in the two areas of capital gains and incentive stock options—by helping the most dynamic segment of our economy—can provide more jobs, productivity and better maintain America as the world's technology leader.

I appreciate the opportunity to present the foregoing information to you.

Mr. Neises. With the chairman's permission, we thought we'd try to make these introductions very brief and deal with those 12 questions that were submitted, with, we think, great wisdom. Those really touch all the points, make a lot of sense, and if you don't mind, we'll just fire away at those, interrupt as you will, and we'll go from there.

Representative Lungren. OK. Good.

Mr. Neises. Dan, are you going to handle the first one?

Mr. Holland. Yes. Thank you. The first one is:

What is venture capital financing and how does it differ from other forms of financing?

I selected this, since I've worked for banks, insurance companies and in the venture capital business and, therefore, have a view of experience of several of these different forms.

I think it has to be kept in mind that venture capital, although there has been a lot of publicity surrounding it, is actually such a miniscule part of the whole capital markets, that it's really lost in the noise. I sure wouldn't want the venture capital community to get into a pot limit poker game with the insurance industry, the banking industry and the investment bankers. But even though, you know, in terms of capital markets, it would be lost in the noise, it's a very interesting end of the market spectrum, in that it's at the high risk, high return area, hopefully high return, certainly high risk. A difference in a lot of ways, because—the most important is in terms of the amount of involvement and the long time involvement as venture capitalists, as individuals and as organizations put into their association with the investments that they make, much different than the stock market, much different than commercial bankers or institutional lenders.

So it's a long time involvement. We set up our partnership. They're usually 10- to 15-year partnerships. We're totally committed to that, as partnerships. And in the companies that we invest in, it's a 3 to 5 to 15-year involvement, usually, before we can realize the kind of returns that it takes to make the business worthwhile.

In addition, we have a very indepth association with the investment that we make. Usually one individual, sometimes two from the venture capital company, will become very deeply associated with an investment, on the board of directors, as adviser and sometimes very close friends, sometimes enemies, with the people that we invest in.

We try in a lot of ways to provide what we call "background management assistance." This is a lot different than other financial institutions will provide. We have a certain amount of "know-who" and "know-how" in the business that's often very helpful to new companies getting started. But our main purpose is really to support entrepreneurs and to let them manage companies, as we slowly fade in the distance and pay back the money that we've invested, to our investors.

Mr. LITTLE. One of the questions asked was:

What existing Federal policies are most effective in increasing the supply of venture capital?

I think you've probably already heard this from a previous panel, a number of these, and I would just really underline the lowering of the capital gains taxes and particularly underline the differential between capital gains income and personal service income. I think it's very key to maintain a differential there.

One point that is sometimes overlooked, because it has been a given for long time, is the fact that partnerships are not taxed at the partnership level but are at the general partner or limited partner level. So they really act as a passthrough to the investors in the fund. The great majority, and increasingly so, increasingly large majority in the venture capital business has gone into partnerships, and from the partnerships into the various portfolio partners. Very key to leave those partnerships untaxed at the partnership level.

On the securities front, the SEC's liberalization of a whole variety of rules which pertain to private placements and particularly the liberalization of rule 144, which allows venture capital companies to—really allows them stock in companies in which they have invested, after those companies go public.

I think that it is often true that, as venture capitalists, you provide most of the money—or the group of venture capitalists—most of the money for these emerging businesses. As a result you usually end up with a large chunk of stock. One of the things that's important to us is to be able to realize the value in that stock, once a company goes public. And by having liberalized the 144 rule, so that we can dribble that out without going through the expense or having the company go through the expense of a registration statement, is key.

Certainly, on the Labor Department front, the clarification of the ERISA rules for pension funds is very important. A tremendous amount of money going into the venture capital business is from pension funds, and allowing them to really operate under the portfolio theory rather than looking at each investment, second, is very helpful.

Some other areas, frankly, aren't quite as important, but certainly the tax credit has been of some assistance.

As an overall comment, the absence of regulation, and you have put it, Representative, you know, as staying out and not screwing up the process, frankly, it has been very helpful.

I think Jack is going to talk a little bit later about ISO's, so I'll let him cover that subject.

Mr. NEISES. Thank you.

The third question that was posed to our panel was:

What new Federal policies would be most helpful in further expanding the pool of venture funds?

We have, I'm sure, a lot of things we'd like Congress to consider, but really, it's best to ask for a few that are really important to us.

Alex d'Arbeloff made a very good stab at the incentive stock option problems. I'll try it again. It is a very complicated thing.

First off, he talked about the alternative minimum tax. In other words, this gets over into your tax preference items, which is a complicated section, and certainly people lower down in an organization don't understand this. A lot of the executives that we've dealt with in my board of directors—I sit on six boards—do not understand. But basically, it means you're thrown into the tax preference item. When you exercise the option, you can get nailed with a 20-percent tax. Then, when you go ahead and finally sell the stock, you're taxed again, so it's double taxation, which is not a concept American tax policy has ever gone for. The further problem you have is, when you first exercise that option, you're taxed on what accountants call an accrual basis. And again, most of us taxpayers, all our lives pay taxes on a cash basis. In other words, you don't pay taxes until you get some cash.

And the worst thing of all that can happen in this situation is you pay the alternative minimum tax, later the stock price goes down, and you actually get a loss. So you've paid tax on something which lost you money. Now try to explain that to a holder of ISO's. It's very complicated. I've seen—I think the people that it hurts the most are the wives of these entrepreneurs who ended up, you know, going to the bank borrowing the money to pay these taxes and later they lose money. This is a very scary thing, to have this sword hanging over you.

All I'm saying is, why don't we simplify it and make it the way all other taxes are. When you receive the income you pay the tax and get it out of this tax preference item and alternative income. This could be the most beneficial thing, as we see it, to allow us—and we're part of, actually, the incentive system in this country. What we often do, particularly as our companies get larger, we have a need to attract high-powered, competent managerial people.

Mr. LITTLE. We have a company that we financed a few years ago. The man who really started it was fairly well along in age when he did start it, and he retired last year. Se we needed to bring in a new top executive. It is a publicly owned company, and in our negotiations with this new executive we came to the conclusion that he ought to own at least 3 percent of the company, not a large amount.

But in order to be able to do that we really had to offer him a program where we would grant him stock options over a 3-year period of time. Now, as it turns out, with what has happened to the price of the stock, it is going to now probably be a 4-year period of time because the better he does and the better the company does, the more the stock price goes up, and he says, hey, I am really fighting against myself here.

So this maximum really is a major problem.

Mr. NEISES. The next question, why is Boston's Route 128 such a fertile ground for venture capital?

I see it as a matrix or a confluence of factors, I guess the most important of which, coming from the Midwest in a town that valued greatly staying with large companies like Procter & Gamble and Cincinnati Milling Machine, was that it really was frowned on in the city I grew up for someone to leave a large company that was doing well and start something.

And I think here there is a very definite cultural reinforcement that that is a good thing to do, and you get the support from your family and everyone else to jump out and do it. And I believe that is the key factor.

We have heard a lot about the universities and the infrastructure. I think that is very important. And then in practical terms I think another highly significant thing is you need a large pool of hardware and software engineers.

So in many of our high-tech companies today, we now have 50 percent of the development people in the software area as well as the hardware. So it is 50-50, and that kind of talent is simply not available in large areas of the country.

But I would add a few, like there are a number of others that Bill Foster mentioned, but I think there are others that are coming. At any rate, the existing pool of talent I think is the key one.

Representative LUNGREN. Is there any particular reason why you came here? I mean, were you looking upon this as a possibility of being a venture capitalist, or did that develop after you were already in the area?

Mr. NEISES. No; actually I came here to attend Harvard Business School, liked the area, and then later when I was at Xerox I was offered the job of general manager of Dennison's Copier Division, which was here in the Boston area, and I had always liked the Boston area. So that made the acceptance of that job one more attractive factor.

So I came to do that, then left that to start our business here at Charles River 14 years ago. I was one of the founders, and we all left large companies and good salaries to go out and raise a new fund of venture capital. So we started something, too, in an entrepreneurial sense.

Representative **Lungren**. Is there any reason for you to believe that venture capitalists, now that it has been accepted and discovered that it worked in this area of the country and works in Silicon Valley, can't find homes in other parts of the country?

Mr. **Neises**. Actually, our capital—we have—I mentioned we invested $80 million. We have just raised a new fund of $77 million, and I am a lead investor in Dallas, TX. One of my partners is a lead investor in California. Another is leading a deal in Seattle, WA.

So, have gun, will travel. We are very willing to go wherever the good deals are, and I think my colleagues would do the same.

Representative **Lungren**. See, I mentioned to the other panels that many of these entrepreneurs remind me of people in my area that were the entrepreneurs of the twenties. They were in the oil business. They were called wildcatters. It seems to me they did some of the same things that folks are doing now with intellectual property, and they were venture capitalists. We probably didn't use that fancy name, but friends and neighbors and other people invested in them when they drilled those holes. When they drilled the good holes, they made money. When they didn't, they had the bad times.

So that spirit has been in different parts of the country, and I don't see any reason why you can't have it in other parts of the country as well, but it is just an interesting inquiry as to why it developed here and why it developed in Silicon Valley. You wouldn't really say that those two areas are exactly the same.

People like to say a lot of things about us in California, and they also like to say things about you folks in New England, but there are different things that they say, and you wouldn't normally think of those two areas as being areas where you would have parallel developments, and yet it has occurred.

Well, let me ask you this. In Silicon Valley the venture capitalists we spoke with indicated that there is more venture capital than there are available investments there right now and that they are going other places.

You have mentioned, Mr. Neises, that your organization is now investing in Dallas and other places.

Do you find that among the rest of your brethren in the venture capitalist business?

Mr. **Holland**. That is a tendency to work closer to home. When you are involved with new companies, it is a lot easier if you can take a 1-hour drive rather than a 5-hour plane ride when the company has problems or opportunities.

However, as Jack said, in that particular climate where there is venture capital, we are global in the sense that we will make investments across the country, but we will tend to concentrate closer to home just because of the need that you have in terms of working closely with companies.

If you take a look across the country, though, you see various pockets of new venture capitalists springing up. Certainly Cleveland, Chicago, Minneapolis are very strong areas of venture capital activity now.

Representative **Lungren**. Is that a fairly recent phenomenon?

Mr. HOLLAND. Well, it is not recent in that they have always had venture capital funds, but because of just the growth in venture capital activity and opportunities now these firms are expanding and new ones are coming in. There have always been small pockets in each of these—across the country. You see it coming up a lot more in Texas now. Venture capital firms are expanding, they open offices in Texas as well as in the California area. East coast venture capital firms are going that way.

So there is a growth in venture capital, but what you, I guess, are asking is, is there a paucity of venture capital in certain regions and should the Federal Government be doing anything is this area?

When we ran Mass Capital Resources, we were getting visits at all times from places as far away as Alaska and Tokyo regarding what was happening in Massachusetts that made this the growth areas for this type of capital activity, and it is a very, very difficult question to really wrap your arms around.

The entrepreneurs earlier focused on the whole infrastructure that you need in areas. It is not venture capital that is the start of entrepreneurial activity, and you can't just put six venture capitalists in Butte, MT and expect from there that the availability of venture capital and others will engender a Route 128.

You need the university structures, you need the role models, you need the infrastructure and support of other industries, and venture capitalists by and large are opportunistic enough to, when those things exist, to follow and/or start activities in those areas.

Representative LUNGREN. We had Mr. Hatsopoulis here yesterday, and he indicated that it was very much like creating pressure in some environment, and he indicated that growth will take place or things will develop, but you are not sure quite where in that environment.

And he suggested that if the Government tried to impose it, just say, aha, we don't have venture capital in this region, let's see what we can do to put it there, that we would probably undo a lot of the good that otherwise would be done.

His suggestion was we create an environment in which entrepreneurs can develop, in which venture capitalists can exercise their abilities to take risks and hopefully achieve some successes, and that they will find in areas perhaps that we can't even perceive at the present time their opportunities.

Do you have any disagreement with that?

Mr. HOLLAND. Not at all. In fact, when we were raising our funds, several of the people—some people said where do you see the opportunities for the future? Where will you be investing and in what technologies that are going to be important 5 years from now? And we had to simply say we really don't know at this point, that the opportunities come from the people and the ideas and the environment that is available to them.

And no one can predict or force this type of growth. And I think that is true for the Federal Government policies. So you do have to let, I think, the free market environment, the free enterprise system foster, under pressure, the opportunities.

If you take a look at New England, I think one of the pressures we had here in the 1950's and 1960's was that we lost the textile industry and the shoe industry and a number of other industries, which made a couple of things available in the infrastructure.

One was very inexpensive space. Digital Equipment Corp. started in an old mill at 40 cents a square foot, as well as a great multitude of people who could work in these industries which tend to be labor intensive. Interestingly, the kind of people who could work in the shoe industry and textile industry were actually transferable to the high-technology industry.

Mr. LITTLE. Yes; I think one of the interesting things which shows how things come around is that my father happened to have been in the textile business, and one of the mills that he had to close down was the very mill in Maynard that Digital Equipment started up in, just to really emphasize a point.

Representative LUNGREN. That is an irony, and it also indicates that if we were making a public policy decision to seek Government interaction just prior to that time we probably would have done everything we could to ensure that the textile industry would have maintained itself and not been competed with for labor and other things by this new fledgling industry that no one could fully understand.

I guess the next question we have here is: Is there too much venture capital money chasing too few deals in Boston's Route 128 region?

Mr. LITTLE. I would give the answer to that just a plain "No."

I think, with some elaboration, I really have had the opportunity, and I am sure these other gentleman daily talk with quite a number of people who are venture capitalists in this area. All of them have told me over the past couple of years of a number of good opportunities that they see, and qualified opportunities.

We all see, you know, approximately 100 situations for every one or two that we end up investing in, but in terms of the qualified numbers of situations, which are ones really where you are even looking at people with integrity and talent and with a technology that you really think is an appropriate one to finance, all of us are having the opportunity to look at a lot of those.

I would underline again, though, that what Jack said, which is that venture capital is indeed very portable. As I mentioned, we are all over the country. We do again tend to invest more in the Northeast quadrant of the country, say, you know, from Chicago maybe down to Tennessee and Kentucky and across to Washington, DC, and up, and again that is because of the reasons mentioned.

I am sure you are aware that one of the basic formats, particularly in the early stage investing, is that it is very rare to find just one venture capitalist in a field unless it is really an absolutely seed capital, you know, a couple of guys in the garage sort of things. But most of the time there are two or three or four or six of us in one situation.

We, for instance, work with Brentwood from the Los Angeles area. We work back and forth with them. If we find something in this area that we think is appropriate that they might be interested in, we will talk with them about it, and vice versa. And so it is important to understand that.

Representative LUNGREN. You know, when you are talking about the proper deals and making sure that you invest in the right thing, obviously we know mistakes are made. It reminds me of what Bob Noyce said, who is, I guess, considered the godfather of Silicon Valley, with Intel, and he tells the story about how his wife came to him with this hair-brain scheme of investing in some new company, and he told her he thought she was absolutely wrong and she ought not to invest in it. He said luckily for her she didn't take his advise, and she invested in this crazy company called Apple.

He was indicating that if he had that difficulty, knowing as much as he does in the industry, he really wondered how Government could come in and make better decisions with the best and the brightest, deciding what were good deals and what were not good deals.

Another question, of course, we have is: What Federal programs are most important in increasing the flow of ideas that attract venture capital financing?

I know you need more than an idea. You need an entrepreneur who gives you an indication that he or she can take this to fruition. But we are really focusing here on ideas that are somehow generated such that some of those ideas can become applicable in a commercial sense and are concerned about those Federal programs that either inhibit or actually support that flow of ideas.

Mr. Little. Let me make a couple of general comments that would second what some of the entrepreneurs said earlier, and that is the general support for university research is, I think, incredibly important.

Representative Lungren. Would that be basic R&D, or would that be applied? We have had some disagreement.

Mr. Little. I tend to think of it as—this is a personal answer on my part—I tend to think of that as being basic R&D. Some of it might be applied, but my inclination would be to think of the basic R&D.

So many of the companies that we finance indeed are companies that are really then doing the next steps, which are, you know, taking all the technologies and really applying them to specific industries or for other combinations of technologies.

So I would tend to think in terms of the basic. I think there are a couple of other specific programs that go to that area, too, and those are the National Science Foundation's and the SBIR Programs. NSF Programs have been around a little bit longer. SBIR started a couple of years ago, and I think particularly the SBIR Program, which I have been more intimately involved with, is interesting to me from a couple of points of view.

One, it really directs the large Government agencies to put out some of their research dollars to small companies, and it really simplifies the whole process for small companies to be able to compete for those R&D dollars.

And I think more importantly, or equally important, the Government has also said, however, you know, we will give you a little bit to start but the next, you know, chunk to go further than that you have to have matched by private sources. So it isn't just the Government.

But then you really get the marketplace involved, saying, yes, we really think that this is an idea, that is, a basic idea that can be applied, and it really stands the test of something that can make money and is commercially—is it going to be commercially successful rather than is it just an interesting idea that, you know, we ought to support to kind of see were it come out.

Representative LUNGREN. Do the other two of you agree that SBIR's are important?

Mr. HOLLAND. I have had very little experience with SBIR's. Jack.

Mr. NEISES. I don't know that much about SBIR's either.

Representative LUNGREN. The only thing we heard in Silicon Valley were some negatives about those programs, and as I recall, we voted on that program in the Congress—maybe it is because Stanford University has a great influence there—but I do recall that the Member of Congress who represented that area at that time was very negative about it and I have come out here and found that there is a different attitude toward it on the part of some people involved.

Mr. LITTLE. With all due respect to my alma mater, David Kennedy, who was the president of Stanford, was the leading proponent for the universities against the SBIR Programs, because quite frankly they saw it as being a threat to the amount of dollars that they would have to support their research.

I think, very frankly, if you would look at the close interrelationship between a number of companies, particularly Hewlett-Packard there in the Silicon Valley area, you might rather expect Stanford University and them to line up together. There is not the same connection here.

One other program that I would really urge—and I have been for many years urging—the Congress to take a little bit stronger look at in a few ways is the SBIC Program.

Our company started as an SBIC. Jack certainly has been involved in that. One of the great problems with the SBIC business lately has been the inability for people to get leverage, and quite frankly, if you can't get the SBA leverage or the SBA-guaranteed leverage, why in the hell be in that program?

I mean, essentially what you are doing is you are trading the ability to get slightly less than, you know, money market dollars for a whole bunch of regulations, and if you can't get the dollars, why bother?

Now, for a variety of reasons, we happen to be in the process of turning in our SBIC license. We are going to pay back 30—back a little more than $32 million of SBA debt, frankly because of the regulatory problems that we have had.

You have heard Jack say that they have turned in their SBIC license. There are a number of other people who have been in the SBIC business for a long time who are turning in their licenses, frankly because of the inability to be able to get additional leverage.

Representative LUNGREN. Does that suggest that the regulations are too onerous? Does that suggest the usefulness of the program is no longer present?

Mr. LITTLE. Well, there are a couple of things that it suggests, and I could go on this subject for a long time. So I will just hit a couple of points.

One of the problems is that in order to be effective in—I have already made the point to you earlier today that really venture capital ought to be supplied through partnerships, and, frankly, the SBA is really—they have it in their regulations to have SBIC partnerships, but they frankly just really don't like them, and so they make it very difficult to get an SBIC license for a partnership.

Second, when you have on top of that the fact that there has been so much pressure because of the whole budget situation that we keep on going back and forth on, whether in SBIC you are going to have $160 or $250 million of leverage available to them on a yearly basis.

And again, one is you are going to sign up for those regulations, but second, you don't have the ability to get the thing that really is the big advantage of the program eventually, and particularly with the availability of being able—the people who are good venture capitalists to be able to go out and raise money from the kinds of sources that we have all mentioned, you know, why put up with the aggravation?

Again, I could go a lot further, but I will stop there.

Representative Lungren. This is a question that I guess could be asked in a couple of ways, but generally speaking, I guess the question is: To what extent do venture capital markets fund productivity enhancing innovations for existing industries versus startup activities?

That is part of the question of whether there is a capital gap that some economists suggest. I guess the first question is: Is it appropriate, in your view, for the venture capitalist to be involved in productivity enhancing innovations for existing industries versus the startup activities, and, if so, is there a proper balance between the two?

Mr. Holland. I would like to take a crack at that. Mass Capital Resources formed in 1978, supposedly in response to the great capital gap that had developed in the early 1970's. That capital gap, if there was one, was primarily a function of the capital gains tax, lack of real money available for startups in entrepreneurial activities.

It is very hard to distinguish—let me put it another way. A lot of new companies start because they see the need for productivity enhancement and value-added type of product systems or services, and they are going into enhanced productivity.

The whole CAD/CAM industry, which was started here in Massachusetts, is a productivity enhancing type of activity for existing industries. They are selling into those industries, and they have been startups on that basis.

But basically, many of the things we look for in venture capital investments are what is the value added, how can you show that your new product service is indeed saving money, increasing productivity, or enhancing the customer of your business with which you are servicing.

In terms of whether venture capital is investing in too late a stage in the companies, in companies that are just about to go public but may not need the money, or to expand existing industries with dollars that could possibly come from other sources, it is a very difficult area.

I think most venture capitalists will admit that the biggest return or the biggest gain for their investors come from getting into the early stage, new startup companies. So there is pressure in all venture capital partnerships to have a good percentage of your investments in new companies.

You take a look in the 10, 20, 30, 100 times multiples on your investments when you start out very early and go through the long stage of development of these companies. However, there is a need over that period of time to continually put money into the companies, and those are called second, third, and fourth stage financing. Those are not always available from the traditional sources—insurance companies and banks. So we do find it necessary to continue to support companies until the money coming from the institutional investors or the stock market is available.

The fun, the big return, the real interest in venture capital financing is in the new startup companies, but you do have to have that ability to continue to fund these companies until other forms of money are available to them.

Mr. **Neises**. I would just add one point to that.

About 30 percent of our capital in our four previous partnerships has been deployed in existing industries versus startup. We did look at that. So we do some of that, clearly.

The next question had to do with whether business schools are teaching the kind of management skills that venture capital firms like to see in entrepreneurs.

I am a member of the Visiting Committee on Entrepreneurial Studies at Cornell University's graduate school, and in the last year I have lectured at Northwestern and at Harvard, and my answer would be generally "no," but greatly improving.

Each of these universities have venture capital clubs, as they call them. The students that are somewhat interested in doing something on their own have taken it on themselves to invite entrepreneurs who are usually successful alumni of that school—and in fact they are not always successful. A few of the entrepreneurs they have invited have had a very hard time. But the whole point of this is that they are getting sensitive to what the entrepreneurial process is all about, and they ask about the risks involved and what did your wife say when you said you were going to start a business or what did your husband say, whatever the case may be.

And the one thing I would say that we have greatly admired in all of the fine graduate schools of business that are around this country, at least, it is a disciplined way of thinking, and if you have a chief financial officer in this entrepreneurial fledgling venture who was trained in one of those good schools you often can communicate with them in a very special way. And I think clearly graduate training in business is very helpful. We are in an operating business, and anyone who studies business with seriousness at a good school is going to be better equipped.

Bill Foster, who testified earlier, had a bachelor's and master's in engineering, but one reason we were attracted in investing in him is his father was an entrepreneur in California, carpentry, had his own carpentry business. From the time Bill was 5 years old he kept saying, Bill, some day you are going to work for yourself.

And Bill, in addition to the engineering training, went off and got an MBA because I think he had listened to his father. So, he has been itching to start a business for many, many years, and he didn't tell you when he left Data General he was a 34-year-old vice president already. But he had the itch to create something.

Representative LUNGREN. Now, do you—I know this is a general statement, but in looking at startup companies, with somebody with a great idea from the technical side, do you generally require that they have a marriage with someone on the business side, or is that in a later development of the company?

Mr. NEISES. Well, I think everyone should comment on that one. We like to see a balanced team. We do not—the seed capital deals, as we call the, where you are backing the lone scientist or the lone engineer, with his burning desire or her burning desire, is a very unusual thing for us. We would like to see two or three people or maybe four people have come together and brought a balance of the disciplines that are needed to run and build a big business. We like to see marketing——

Representative LUNGREN. Is that recognized by the entrepreneurs basically? In other words, you are talking about the culture that has been created here—and that may be an overstatement—but is that generally recognized or appreciated by these technical people who would come with a great idea, that they have got to——

Mr. NEISES. I think a lot of them understand this. However, there are developing now in our industry firms in the venture business called seed capital or very early stage who are willing to work with that lone scientist. They are generally smaller firms with less capitalization, and they bring the company along in almost a promoter's role and round to the management team and get it ready for larger firms like our own to invest.

Representative LUNGREN. Is that a fairly new development in the venture capitalist arena?

Mr. NEISES. Yes. We have one or two firms here in Boston, and there are several in Silicon Valley, and I don't know if there are any yet in Minneapolis or some of those places.

Mr. LITTLE. I would just second what Jack said on that subject. In the very early stage deals that we have done, we have—in one case we had two guys walk into the office and say, you know, we have got this idea to do this better than anybody else does it. We didn't know, frankly, what the hell they were talking about. But when we finally said we would back them, we made it very clear to them that while we were just backing the two of them to start off, that there would be definitive points along the line as the business developed that they were going to bring in, you know, the production person and the salesperson and the person who is going to be the controller, and so on, and so forth.

But as a general comment, we, too, like to see teams of people. If there isn't a team, we make provision for the specific times at which that team will be assembled.

Representative LUNGREN. Mr. Holland.

Mr. HOLLAND. I can see now I am sitting away from my colleagues here because I am going to differ with them on this.

Representative LUNGREN. That is fine. [Laughter.]

Mr. **Neises**. That is OK.

Mr. **Holland**. I think generally in our firm we tend to back a person. We look for a leader in the company. I used to say a man until I look around here.

We know that during the course of a company's growth, sometimes the leader we backed in the early years may not grow enough to continue on where he reached a particular plateau of growth required, but, basically, we are looking for that person.

We like to see that they have the support structure around them as they grow, and that is oftentimes where a venture capitalist will help by virtue of being able to draw on various aspects of their connections and knowledge of industry to bring other people on board, which I think is what we are talking about here.

But we are always looking for the leader, that person with the idea. Sometimes he will come with two or three people along with him, but in every successful company I think, if you look at it, there was one—sometimes two, but usually one who had the great energy and entrepreneurial spirit along with it.

Mr. **Neises**. I wouldn't disagree with that at all. Dan just said it better that I did.

But I think one of the key points of things that we did early on in our history was that often when we spotted that person who was the leader, we expected them to have more talents than were really reasonable for one individual to have, and we also somehow communicated to them that we expected them to be able to run, you know, marketing and sales and manufacturing and handle the money, and all that. And then I look at it and say, boy, that was really dumb.

Representative **Lungren**. I think it is interesting also, Mr. Neises' statement about this new development in the venture capitalist arena, of those that get in at the very, very early stages and bring them along, which may suggest that if we create an environment in which there is enough venture capital out there those things will develop and take care of themselves without the Government trying to say, aha, here is the capital gap and we will establish this sort of organization to take care of it for this period of time.

Mr. **Neises**. If I could just make a comment. I have been in this business long enough so that I have heard all of the discussions at a variety of times about the so-called capital gap.

I always found the capital gaps were the people who really didn't have a good enough business plan and not well enough thought out, so they couldn't get the money, and they were the ones who thought there was a capital gap.

Representative **Lungren**. The first gap I heard of, I guess, was the credibility gap. We have had a lot of gaps since then. [Laughter.]

What types of relationships between venture capital firms and the traditional financial institutions—banks, and so forth, that you mentioned before—are most conducive to the promotion of innovation?

Mr. **Neises**. Let me take a shot at that. I am going to talk about three kinds of traditional financial institutions—banks, insurance companies, and pension funds.

On the banks—let's take banks first. Banks clearly at some point, and hopefully at an appropriate point in time, lend money to our portfolio companies.

The thing that I find interesting has been that increasingly these banks have people who are specialists in small or merging growth companies, and they have a much greater understanding of how these companies develop. As a result, where there are some ups and downs—and there almost invariably are in these kinds of businesses that we finance—these bankers don't go into a state of apoplexy and pass, and that is, you know, indeed very helpful.

I mean, we get calls, for instance, like do you realize that your portfolio company has overdrawn their account with us by $300,000, as well as, you know, somewhat sharper language.

What this means is that in having those kinds of people, the portfolio companies are bankable at an appropriate time, and what that in turn means is that we then can turn our capital and a little bit more of our attention toward financing new companies because we have a banker in there working with a company who, you know, will stick it out and not change every 3 months. And that is very helpful.

As to the insurance and pension funds, as a general rule, the best relationship really is for early stage financing. The first time that you put money in companies is for these types of institutions to invest in the venture capital partnerships, whom we all represent. Subsequently, as portfolio companies become more mature, the pension funds and insurance companies can make direct investments. But they really ought to let the venture capital partnerships invest at the point where the risk is the highest.

There has been a tendency for these kinds of institutions—and sometimes also for bank-related venture capital groups—to jump into the venture capital business directly when the field is what I would call hot, which it has been recently. By and large this doesn't work. One, because there is a tremendous amount of inconsistency, you know, jumping in and out, depending upon how the business is.

I mean, anybody who has been in this business, as all of us have for a number of years, will tell you that sometimes when things are going well, money is flowing, things are going—you know, and things are proceeding smoothly. There are also times like 1974–75 when everybody was calling for our early demise.

The other thing that happens when these people jump in and out is they tend to jump in at the high point in the market, and they they get very rapidly disillusioned when things begin to slide downhill.

An additional point, and I think something that was really emphasized in the first question that Dan asked, is that so much of the venture capital process is really the intensive work that we do with the portfolio companies, both the ones who are expanding very rapidly and ones that are sliding backward very rapidly, because there is dynamic change going on in both of them that needs a lot of attention. In general the people who work for the more traditional financial institutions are really not well suited and may not have that kind of long-term outlook to work with portfolio companies over a period of time.

Representative **Lungren**. I guess it is a fact that many new venture capital firms have been formed over the last couple of years. There have been some suggestions, some articles in major magazines at the present time, saying that too many have been formed, that there is a crisis—I don't know it that is an overstatement, but there is a problem in the venture capital industry. Someone suggested the rapid growth has caused a diminution of the quality of those involved, that perhaps they can't lend the advice and the oversight to some of these ventures that the older established firms can, those that at least have experienced personnel with them.

I would just ask your general comments to that, and also ought we to expect what some people are calling an impending shakeout in the industry itself?

Mr. **Holland**. That is a tough one.

Representative **Lungren**. In 15 words or less. [Laughter.]

Mr. **Holland**. There have been excesses, small ones. Basically, as we look around at our colleagues in the venture capital business or partnerships, by and large they are formed by people primarily with many years of good experience in the business. Funds are larger today than they were 10 years ago. So the whole industry has gone in that manner.

I think, you know, there have been excesses, but nothing to suggest that everybody has been going wild in the business. If you take a look at the basics of the partnerships that have been formed in Charles River, with four different partnerships over a period of years, those are all considered new funds. Our funds are new ones, but Jim Morgan and I have been in the business for 20 years, having more today, I agree, together. And I think as you look at the venture capitalists, for the most part you will find they are a very experienced professional group of people.

It turns out now that this does take a lot more money and quicker time to get a new company started. Digital Equipment Corp. started in 1957 on $70,000. You can't do that in today's market. It took them 2½ years to get their first minicomputer on the market. In today's marketplace you have to be there in 6 months or the market has left you.

So there has been a great pressure on venture capital investors as well as companies to start faster with more money, and I think that is one of the reasons you have seen the great growth as well as the activity in the business. But I know all the people which we are in partnership I feel very comfortable with, in terms of their degree of commitment and ability to work with companies.

Representative **Lungren**. You mentioned that now the market is such that you have to bring things online much faster, and, Mr. Little, you indicated that you have got to have to long-term commitment or long-term approach.

I have heard some criticize the venture capitalists by saying—they almost suggest that you are too speculative in nature, that you are looking for the fast investment over the shortest period of time and, in fact, that rather than the long term you are really looking only to the short term. You suggest just the opposite.

Mr. **Little**. Any time that you have a tremendous amount of money coming into any particular financial kind of institution—and that is whether it is mutual funds or real estate investment trusts or leasing companies or whatever—you are going to have some small minority who unfortunately get the majority of the headlines, of people who are not well-disciplined and who frankly are Johnnie come lately's who really don't understand what they are doing and are frankly looking for performances quick.

But I think, however, if you look at the statistics relative to the venture capital industry, you can find a few things. One is that the number of professionals in the industry have been growing at a very rapid rate, and that is despite the fact that this is really an apprenticeship kind of business where you have to serve a certain amount of time. You can't get, you know, instantly anointed. And so that is one of the things that has happened.

I think any time, frankly, that there is a very, very bullish market for initial public offerings, as there was in 1983, there are going to be some companies that are financed and come to market in a remarkably short period of time. This is going to give, in some cases, the appearance, and perhaps also in a small number of cases, you know, the reality of things just moving very quickly, and that kind of quick buck label, if you will.

The fact of the matter is, if you go back and look at it, that you only have that kind of a market about once every 10 or 12 years. The result is that the people like—as you see before you this morning—are people who have to realize that the public market is not going to bail you out of the assessments that you make, that you are going to have to put money in companies.

We have had companies—we have one company now that is doing about $70 million of business. We had to put money into that company 17 times before they finally showed a profit. We did question our judgment from time to time on that one, but, you know, you don't have that market that is going to give you the quick profit. So you have to have that long-range, patient view.

I would again emphasize what Dan said, though, and that is that nowadays in terms of these early stage technology companies, things are happening much more quickly. I mean, the same kind of events are compressed into a 6-month period that formerly were in a 2-year period, and so you really have to pay very—you have to really stay on top of the situation in a concentrated way because you just don't have the luxury of time to sit down and take your time and watch things develop slowly.

Representative LUNGREN. Let me ask you a question that goes to sort of a general question, as the responsibility that you would feel that you have toward an already existing enterprise in which you are involved. Do you have conflicts of interest that develop if two key people from a company—two key technical people from a company come to you and suggest that they wish to go off on their own? They have this great idea. From a business standpoint it looks good to you, but there is the probability that those two people leaving the firm to which you already have a financial commitment may, in fact, hurt that firm.

I don't know whether you have confronted that.

Mr. LITTLE. Have you had one of those, Jack?

Mr. NEISES. I have had that happen, and fortunately the people that were starting the company were discreet enough not to discuss it with me because I was on the board of directors of the company and would have done everything I could to get them to stay there.

I think it would be very wrong and immoral for us to be on the board representing all the shareholders—and they are not all venture capitalists by a long shot—and encourage key people in that company to spin out and do something to hurt the company.

So I think you have got to be a good director and be responsible to the shareholders, and in our 14 years, I think, that has been a good guiding rule for us.

I wanted to make one point on——

Representative LUNGREN. Do you find that to be the guiding rule in your industry?

Mr. NEISES. I believe so.

We have heard a few remarks here about the quick buck. I would have to mention, the SEC is a very good regulatory influence on venture capital.

I think we heard all the entrepreneurs testifying on how many rounds of venture capital went into their companies. If you do four rounds of venture capital, you will have to hold each of those, every investment, for at least 3 years before you can sell without regard to volume restriction. If you remain on the board or are a control person, you are limited even further.

So I don't know how you make a quick buck in our business when the SEC says at minimum you have got to hold an investment 2 years, which would be subject then to volume trading rules if it had already gone public, but in practical cases our holdings are usually so large in a particular company that you can't really do any selling until you have held it at least 3 years.

Well, if you have been in the company 4 years and the last round went in in 1983, you can't sell that until 1986. So I don't really understand the quick buck story here. They aren't that quick.

Mr. HOLLAND. Congressman, in terms of the question as to whether or not we will back people who are presently members of the venture capital of that company and decide to leave and start another one, I would hesitate to back anybody who came from a company that they were investors in.

Mr. NEISES. Right.

Representative LUNGREN. That is the spirit of competition.

Mr. NEISES. You bet.

Representative LUNGREN. Another question we have concerns recent State activities to encourage innovation within their own States.

Do you have any idea whether they are likely to be more or less effective than Federal policies to encourage venture capital activity?

Mr. HOLLAND. On balance, less effective. There is some good in it, I guess, and some problems that can arise from any totally State-related activity, and having been involved in it for several years I think I see it from the inside, I think it is difficult or bad where there are restrictions placed upon investments or activities that tend to concentrate the activity within the State, within the State boundaries.

It usually results in an effort to channel funds only within the State, and we have seen examples of that, and now we are doing an activity where you can only invest a certain amount outside the State. But that tends to really lessen or decrease the excellence of the funding activities.

I think the biggest problem was just the whole restrictive nature of things. You have to have your plants here. It makes it difficult to move out of the State. When most of the venture capitalists we have now are global and have the opportunity to move freely, it tends to be restrictive and therefore hurt their profits.

Obviously, there are some things the States can do. I guess in California you just recently enacted a State income tax or capital gains tax to make it more encouraging for people to invest in new startup companies. We don't have that in Massachusetts.

So those type of activities are good.

Representative **Lungren**. The last question we had listed was the significant actions that Federal, State, and local governments could take to encourage entrepreneurial and venture capital activities. You mentioned a few at the beginning.

Do you have any other suggestions?

Mr. **Neises**. Yes. Well, you have already done a lot, frankly. Let's say the enablement by the Department of Labor to let pension funds invest in venture capital has been a tremendous boon. I think we have been over and over the capital gains tax reduction.

We were all in the business back in the middle 1970's, and it was a wasteland. The reason, though—I don't think this point has been made this morning—is that the differential between ordinary earned income or personal service income and capital gains is very important. I didn't hear that said.

When it was 50-50 back in the late 1970's, we had a devil of a time getting well-paid managers to leave large companies, in a nice, warm environment there with good pay and lots of perqs, 50 percent ordinary income tax—and which had dropped from 70, by the way, if you were a highly paid exec.

Representative **Lungren**. Right.

Mr. **Neises**. So here you were looking at 50 percent, and capital gains taxes were 50 percent. So that was a push.

The other terrible thing that occurred was people were investing in CD's, getting 20 percent interest in those days. Why take a risk on this screwball venture capital and if I win I only win half of it, Uncle Sam takes the other half? The risk/reward relationship was all out of whack, so that the capital became more sterile in the sense that it didn't go into our kind of business.

That is the thing that worries me so much about this simplification of taxes where, OK, let's make everything 20 or 30 percent. By that I presume ordinary and personal service income would be the same as capital gains. It is that differential that makes the people want to jump from large companies and take a shot at this higher risk. That is a key factor.

We talked at length about the ISO's, or incentive stock options. Another pet—one of mine—is quality educational programs. I think the Federal, State, and cities can do a lot there. I got some GI bill money to get a graduate degree. I don't think I would have gotten it, and I bet the Federal Government has got a lot more tax money out of me as a result of having gotten that MBA. The best $4,000 they ever invested, I think.

Representative **Lungren**. Are you satisfied that the business community in general and the venture capitalist community is doing enough as individuals and as an industry to support education?

The reason I say that is for a long period of time everybody has been hitting on the educational system. I have suggested that until businesses in high tech and all the rest of them that know the very direct importance of the educational institutions we have, until they get involved on the local level as regular citizens and have their employees involved, we can talk about the people at the top all we want but when there is a grassroots effort to improve our educational systems, then we will improve it.

Mr. **Neises**. That will help a lot. The wherewithal for us to finance high-tech companies is really in the hardware and software engineers that make these things happen, and unless they go to quality schools and get the training, there is no way it is going to happen.

Now, maybe the Federal Government can help finance the promising students in science and education—or engineering and then collect the money that they lent them. You know, that has been a real disgrace. I think if someone gets a benefit they ought to pay it back.

Representative **Lungren**. Last night I went to a restaurant here in town, and I was talking politics with the waitress. And she was very, very upset because she said there are no student loans available and she goes to medical school. And she had to work 1 night a week. And then she informed me that her father was a doctor. That is a strange attitude we have in people. That person is going to have a very good income potential for the rest of her life if she becomes a doctor, and to resent the fact that she has to work 1 night a week in order to do that I thought was a bit unusual.

Mr. **Neises**. I have no sympathy for her. I do for people who absolutely can't, you know, maybe a family with six kids.

Representative **Lungren**. No; I understand that. But, see, the student loan program now has been adjusted so that it targets in on the most needy.

Mr. **Neises**. That is the way to do it.

Representative **Lungren**. I think we have to recognize that at times we are going to get benefits from government programs, and if we are going to have to pay for them or pay them back at some time in the future.

Mr. **Neises**. Right.

So I guess all we are saying, in closing, is a quality of life framework. I mean, in a city where there is a lot of crime and poor education, like New York City, I haven't financed an investment there but once in 14 years. The entrepreneurs simply aren't in New York City. They are not starting businesses, and it just shows you how government can screw up the quality of life to the point where people won't start businesses.

Representative **Lungren**. Let me ask you one general question. That is, venture capital has historically been a uniquely American institution, and now, as I understand it, we find venture capital beginning to flourish in other countries.

Do you have any idea how foreign countries' venture capital may differ from the American venture capital experience?

Mr. NEISES. I will take a stab with what little I know from Peter Brooke, who is the dean of foreign venture capital establishment. He happens to reside here in Boston, and I have an occasional lunch with him.

But it is a much more difficult process because—for example, the Wall Street Journal just had an article on the German economy, and it is thought to be money grabbing and a very bad thing to start a company, and in the United Kingdom there is some feeling about to enrich yourself too quickly is a bad thing.

So if you start out with that kind of a cultural fabric, I would think it would be very hard to do as much in the venture community.

Mr. HOLLAND. Europeans don't have the same financial structure as we do in this country. They don't have the kind of stock market that we do that makes it attractive to have venture capital. You have a whole different institutional banking structure.

It is not unusual to see companies in Europe with $4 or $5 million debt equity net worth. They are indeed in association with firms started in Europe, primarily through AID, and yet what they did was went out and instead of raising capital, they borrowed a lot of money that in turn they invested in companies. Well, at one point the bankers said pay us back, and if you don't have the money to pay it back, in our terms—we have to borrow money from the Federal SBIC. So this is all very clean capital that we invest. Our investors expect to get it back, but we are not under that immense obligation to borrow money that they seem to have in Europe.

It is a totally different atmosphere and structure. I think it would be very difficult to have venture capital as we know it here to ever get carried forward into the other countries.

Representative LUNGREN. The only reason I bring that up is that people like to say that all the Japanese are competing so well with us in automobile manufacturing and other things, we ought to go there and take a look at what they do and bring all those lessons back here.

Well, I would like to go there and take some of their lessons on tax policy back here in terms of capital gains, which is virtually none over there, in terms of the way they have their tax system such that it encourages tremendous savings versus what we do in this country. They don't have the tremendous incentive for consumption that we do as opposed to savings.

But you look at a lot of the things they do. They have some cultural aspects that I think perhaps make them more able to do certain things in manufacturing than we can do.

At the same time we have the flexibility of the risktakers here and the entrepreneur here and the venture capitalist and the stock market and those sorts of things which give us a uniqueness compared to them, and we ought to build on that uniqueness as opposed to trying to copy what it is they have.

And I would just hope in the Congress that we would take more cognizance of what it is we are achieving in terms of the high-growth industries and the high-tech industries and what lessons that may give us for the future.

If we attempt to create some massive national industrial policy as the answer to the problems we have with the rest of the world, when at the same time the Japanese are sending groups over here to study the entrepreneur and how he or she operates because they would like to copy a little bit of that, we may be borrowing the blueprint from the past to try and direct us to the future.

These seats of hearings are established in part for us to take a look at that.

I know that you can't take everything that is involved in the high-tech industries in Route 128 and Silicon Valley or even the venture capital arena and expose it at large to the entire country and say that is going to solve all our problems. But at least there are some lessons that I think we can learn there that we might apply.

You, as the other panelists, have been very generous with your time, and I certainly appreciate it.

I know your time is valuable, and I know that you took some time in preparing for your testimony today. We only hope that we can get some of these lessons that we learned from your testimony and the testimony of others into the hands of our colleagues so that we might make some different choices in the future in the Congress.

So thank you very much.

Mr. **Neises**. Thank you.

Mr. **Little**. Thank you for your time. I assume that you are running again this year. So we know you have something else to do as well.

Representative **Lungren**. We are all running. [Laughter.]

Thank you.

[Whereupon, at 11:55 a.m., the committee adjourned, subject to the call of the Chair.]

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